The measuring of urban amenities index and its effect on migration: Evidence from Indonesian cities

Arif Rahman Hakim
(corresponding author)
Universitas Indonesia,
Depok, Indonesia
E-mail: arif.barzanje85@gmail.com,
E-mail: arhaqkm@gmail.com,
E-mail: arif.rahman74@ui.ac.id

Nachrowi D. Nachrowi
Universitas Indonesia,
Depok, Indonesia

Dwini Handayani
Universitas Indonesia,
Depok, Indonesia

I Dewa Gede Karma Wisana
Universitas Indonesia,
Depok, Indonesia

More and more Indonesians are living in cities, drawn by the amenities they provide. However, the literature on amenities and migration pays little attention to the three major types of amenities – natural, social, and public – as non-market goods, and their contribution to attract migrants. This study aims to formulate an urban amenities index for Indonesian cities and to explore the role of amenities in migration. The results show that amenities play an important role in migration to Indonesian cities. Specifically, cities in the island of Java have a high urban amenities index, followed closely by the cities outside Java that are provincial capitals. The study provides insights for the government in formulating city development policies with regard to provision of amenities.

Keywords:
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Introduction

Over the last few decades, cities worldwide have experienced physical as well as population growth. Their economic development has expanded beyond administrative boundaries (Duranton 2015), unleashing their potential to attract people from outside them to live or settle, thereby increasing the level of urbanisation, or the proportion of the urban population, in a country (Turok–McGranahan 2020). The United Nations reports that globally, the percentage of people living in urban areas reached 50.1 percent in 2007 (UN 2011), and the world will reach over 56 per cent of the urban population in 2020 (UN 2019). The trend is more pronounced in developing countries such as Indonesia. More than half of Indonesians now live at urban areas. According to the Indonesian Central Bureau of Statistics (2010a), the proportion of the population living in urban areas increased from 14.8 per cent in

1961 to 50.6 per cent in 2011. This share is expected to increase to 56.7 per cent in 2020 and 66.6 per cent in 2035.

However, this figure must be distinguished from the urban population growth rate, which depicts the percentage change in urban population over time. The United Nations reported that globally, urban population growth rate slowed from 2.16 per cent in 2000 to 2.13 per cent in 2010 (UN 2011). In Indonesia, the rate decreased from 4.4 per cent in 2000 to 3.3 per cent in 2010. Urbanisation has three elements: the natural increase in the urban population, reclassification of rural areas into urban areas, and rural to urban migration (Buhauq–Urdal 2013, Firman 2015, Ananta 2020). Between 1980 and 1985, 35.2 per cent of the urban population growth rate in Indonesia came from a natural increase and 64.8 percent from regional reclassification and rural-to-urban migration (Tjiptoherijanto 1999, Firman 2004). The natural increase was 36 per cent from 1990 to 1995, with the remainder owed to reclassification and migration. In Java, one of the Indonesia's largest island and home to a majority of its population and the locations of the nation's capital, urban population growth has been due to location reclassification and migration in several large cities (Firman 2017).

The Indonesian Central Bureau of Statistics (2010b) established three criteria for defining urban areas: (1) population density, (2) percentage of households engaged in the agricultural sector, and (3) urban amenities. The last includes schools (education), markets and shops (economy), hospitals (health), cinemas, hotels (recreation), and households that use telephones (communication), and led to an increase in the number of urban areas. Between 2000 and 2010, the urban area of Indonesia increased from 18 percent to 20.5 percent (Firman 2015). However, this growth did not encourage city governments to provide amenities to support the people, and cities continue to face inequality in urban amenities due to uneven regional development (Ford 1993). As a result, the private sector plays a larger role in creating such amenities through the development of residential areas, industrial areas, and business centres (Firman 2002). Certain cities are still primary destinations for migrants to live and settle; thus, migration intensity has increased in several areas including Java, the Riau Islands, and North Kalimantan (Thung–Juniwaty 2018). Migrants not only move from rural areas to small cities, but also to large cities and even other countries (Zelinsky 1971, Ananta–Arifin 2014).

Such developments inform whether a city has become attractive, offering a diverse range of occupations and amenities and greater earnings. However, cities also provide pollution, traffic, crime, and noise. Urban regions display different environmental circumstances ranging from a clean environment with all amenities to a city with limited amenities (Rosen 1979, Diamond–Tolley 1982). Urban amenities make people's lives more comfortable but can be different in each city (Rickman–Wang 2017). However, households are motivated to relocate considering amenities as location-specific facilities in an attempt to maximise utility, move between jurisdictions, and focus their search on particular locations (Partridge 2010).

Thus, amenities are location-specific facilities that influence migration (Cushing 1987, Clark et al. 2003, Rodríguez-Pose–Ketterer 2012, Hjerpe et al. 2020). These can be classified into three main categories: natural, social, and public. Natural amenities can increase the growth of local residents by attracting them to live there (Rappaport 2007), and play an important role in determining the attractiveness of the area to migrants (Chesire–Magrini 2006). These include climate (Graves 1983), warm winters, cold summers, comfortable humidity, wind speed, sufficient sunlight, temperature, and rainfall. Green spaces, beautiful views, beaches, and lakes are other natural amenities (Rodríguez-Pose–Ketterer 2012, Buch et al. 2014). Social amenities, including low crime rates, social openness, and inclusivity (Clark et al. 2003), are for the utility of urban residents (Glaeser–Shapiro 2003) and explain why people can leave if these are absent (Souza 2014). Public facilities include education, recreation, health care, transportation, and cultural services (Rodríguez-Pose–Ketterer 2012, Yu et al. 2019); they increase the utility for the population and motivate people to visit a city (Alperovich et al. 1977).

However, there is a lack of literature on amenities and migration, specifically on the three groups. Empirical literature provides information on natural amenities, such as the influence of climate, weather, infrastructure, and landscape (Rappaport 2007, Granahan 2008, Chi–Marcouiller 2013) but not so much on other categories. In addition, previous empirical studies see amenities as goods that have a market. This study argues that amenities are goods without a market; as a result, we cannot explicitly determine their value, and need to find an approach to obtain it. Some studies have developed methods to calculate the value of amenities, such as wages and rents as a function of amenities, assuming that the prices of particular amenities have been capitalised into wages and rents at a given location (Rosen 1979, Roback 1982, Blomquist et al. 1988). Consequently, cities with abundant amenities can entice migrants to settle. Amenities are also considered pull factors for migration (Fan 2005, Yu et al. 2019), and this phenomenon can attract researchers to measuring urban amenities and investigating their links with migration. However, only some empirical research has been conducted in developed countries, and remains a new area of study for Indonesia and other developing countries.

The increase in city populations and the resultant need for governments to provide adequate amenities for citizens indicate migration may be caused by amenities. Indeed, amenity-driven migration has been identified as one of the primary reasons for population migration (Faggian–Royuela 2010, Faggian et al. 2011). Good-quality amenities give a city a comparative advantage over others (Camagni 2002, McCann 2004). Amenities can make a city attractive for stay and determine the city's future development (Carruthers–Mulligan 2012, Ballas 2013). Indonesia is an interesting case study to explore in this regard for several reasons. First, Indonesia has unique characteristics as one of the world's largest archipelagic countries, with five major islands: Sumatera, Kalimantan, Java, Sulawesi, and Papua, allowing the diversity of various cultural groups and territories. Second, Indonesia has 93 autonomous cities

and a special capital region (DKI Jakarta). Cities that are included in DKI Jakarta: North Jakarta, South Jakarta, East Jakarta, West Jakarta, and Central Jakarta. According to the classification of cities based on Indonesian national spatial planning regulations, the largest proportion of Indonesian cities, 57, were in the medium-city category in 2015. Indonesia has one megapolitan city, 13 metropolitan cities, 13 large cities, nine small cities, and one autonomous city. These cities may exhibit diverse and distinct regional patterns. Third, Indonesia has distinct developmental phases. Research from developed countries could be insufficient in explaining the context of developing countries such as Indonesia. The map and list of Indonesia's cities for 2015 see in the internet appendix.

Therefore, this study aims, first, to contribute to the literature by creating an urban amenities index by accommodating the main group of amenities, such as natural, social, and public facilities, and using Indonesian cities as a case study; and second, to investigate the role of amenities in migration, particularly at the city level, which has received little attention in the empirical literature. The findings of this study, it is hoped, would encourage the government to consider provision of amenities when formulating city development policies.

This rest of the paper is organised as follows. The next section discusses the methodology in three parts, comprising the framework of building the urban amenities index, how to calculate the urban amenities index calculation, and the empirical model. The following section presents the results that elaborates on the regional patterns of the urban amenities index and the relationship between index and migration. The final section concludes the paper.

Methodology

A measurement framework for the urban amenities index

This study uses a standard model of inter-city location balance. Cities differ in terms of amenity. For example, some cities have better education and health facilities than others, while others have better transportation infrastructure, and a few cities even have low crime rates. Everyone must have the same utility to achieve the same welfare level. If there are labour and housing markets in which people live or depart, they can relocate and impact both markets by changing supply and demand. The primary premise of the model is to attract households to move to places with a better combination of good amenities, higher wages, and lower housing prices, following Roback (1982) and Blomquist et al. (1988).

From the same perspective, households ignore regions that do not satisfy these ideal conditions until the three variables are combined. Because the spatial balance presupposes that all households are identical and have the same utility, moving from one market to another will not help any household. Households who choose to reside in high-amenity areas pay a higher price for their homes through a combination of

higher wages and housing prices. They exchange the amenities for money. Lower wages and higher housing costs provide an implicit premium or expense that households pay to live in cities that have more appealing amenities. The value of such local amenity bundles is referred to as the urban quality of life or urban amenities (Bartik–Smith 1987, Blomquist et al. 1988, Berger et al. 2008).

This model defines the utility obtained by households from composite goods, houses, and amenities. Households can access amenities from city *k* by buying a house in that city, where k = 1, 2,…98, the number of cities in Indonesia. Composite goods and housing are purchased from wages earned from work. Each household has one unit of labour to offer and is paid w_k. Household welfare is defined by using the following utility function:

$$v_k = v_k(w_k; r_k; a_k) \quad (1)$$

where v_k is the indirect utility, r_k is the house rent or the price of housing in city *k*, and a_k is city amenity. According to this equation, an increase in wages increases utility $(\partial v_k/\partial w_k > 0)$, an increase in house rent decreases utility $(\partial v_k/\partial r_k < 0)$, and an increase in the city amenities index increases utility when the consumer/worker is more convenient $(\partial v_k/\partial a_k > 0)$.

Firms produce composite goods by combining capital, labour, and technology, assuming a constant return to scale and firms are identical. It is assumed that the prices of composite goods and capital are constant. The prices of composite goods normalise both wages and prices. In city *k*, the unit cost of production is

$$c_k = c_k(w_k; a_k; N) \quad (2)$$

where c_k is the lowest cost incurred by the firm to produce one unit of output and the capital price is implicit. N is the population of the city, and reflects the agglomeration or congestion effect. A higher input price increases a firm's production costs. Amenities can increase production costs if they are productive for the firm. Additionally, because the population varies, firm costs may increase, decrease, or remain constant.

The spatial equilibrium results from the movement of households and firms between cities so that wages and rent balance the housing and labour markets. Because of the spatial equilibrium, households cannot increase their utility, and firms cannot reduce their costs by relocating. This causes the household to reach the same level of utilisation, u_0, and the cost of firm production per unit is equal to the price of production per unit. In addition, a house can be counted in a certain unit of measurement. Some authors have normalised it to 1. Wages and rents that can ensure balance fulfil the following terms:

$$u_0 = v_k(w_k; r_k; a_k) \quad (3)$$

$$1 = c_k(w_k; a_k; N) \quad (4)$$

and $N = \sum_{k=1}^{n} N_k$, the condition that requires the population to be equal to the number of residents of the city. This equation accommodates the influence of population

(population density) and equilibrium between cities (Blomquist et al. 1988, Berger et al. 2008). To calculate the implicit prices of amenities, the difference between the balance of wages and rent used, f_k is taken as follows:

$$f_k = dr_k/da_k - dw_k/da_k \quad (5)$$

where dr_k/da_k is the equilibrium differential of rent and dw_k/da_k is the equilibrium differential of wages. The implicit prices can be expressed as an equilibrium of the rent differential and the balance of wage differential. After obtaining the implicit amenities price, we can calculate the amenities index in city *k* using the following formulation:

$$\text{urbanamein.index}_k = \sum_{l=1}^{29} f_l^k \overline{a_l^k} \quad (6)$$

The urban amenities index in city *k* is obtained by adding the results from the every multiplication between the implicit price and the mean value of the amenities. This index represents the price that households or individuals must implicitly pay through the housing and labour markets to enjoy the city's amenities. Households or individuals who move to a city will forego their income in the early stages of migration to pay for amenities through the housing and labour markets so that their utility from consumption of the amenities increases.

Urban amenities index calculation method

In this study, we derived the implicit price of each amenity when calculating the urban amenities index. We chose this method because amenities are non-market goods, so we cannot explicitly know their pricing. The hedonic model can be used to estimate the price of non-market goods such as amenities (Rosen 1979). Using the hedonic model, we applied the intercity amenities selection model to obtain implicit prices for amenities. This model is constructed from an individual's choice of city to live and work (Bartik–Smith 1987). Therefore, the selection of amenities must consider housing and labour markets. As a result, the differences in amenities between cities are absorbed in two markets: the rent equation represents the housing market, and the wage equation represents the labour market. Because we want to accommodate a variety of city amenities in the empirical model, the calculation of the amenities index in city *k* is the sum of the implicit prices multiplied by the mean value of each amenity variable (Blomquist et al. 1988, Berger et al. 2008).

We formulated the urban amenities index using data from Indonesia's National Socio-Economic Survey (SUSENAS) and Village Potential Survey (PODES). Both data were collected and published by the Indonesian Central Bureau of Statistics. PODES[1] data provide information for amenities such as health, education, recreation,

[1] PODES data is the source of regional data with diverse content that provides an overview of a region's development situation. Employment, education, health, socio-culture, sports and entertainment, transportation, communication and information, economy, security, development, and empowerment of rural communities are all topics covered in this section. Natural disasters, environmental pollution, social and health problems in the community, and security disturbances in villages are examples of vulnerabilities or challenges. These data collection results can be used as raw material for regional analyses of economic, social, and facility/infrastructure potential.

sports, communication, economy, crime, security, transportation, and nature. SUSENAS[2] provides information on individual characteristics as well as housing characteristics, including wages and rent.

We followed four steps to obtain the amenities index. First, this study used the data published simultaneously in the same year, namely SUSENAS and PODES. We created a dataset for each city (coded between 71 and 79). We merged the two datasets using a specific ID, and structured them by province, city, sub-district, and village. We aimed to construct the urban amenities index for 2006 and 2011 because we found complete information for each ID that could be accessed by academics and the general public.

Second, we estimate the hedonic equation of wages and rent after completing the first step. In the wage and rent equation, *i* represents an individual, *h* is a household, *j* is a village, and *k* is a city. As *k* = 1…98, we can convert the wage and rent variables into values for a year. The empirical model for the wage and rent equations is as follows:

$$w_{ij}^{k} = \beta_0 + \beta_{1e} X_{ij}^{k} + \beta_{2l} a_{ij}^{k} + \varepsilon_{ij}^{k} \quad (7)$$

$$r_{hj}^{k} = \Upsilon_0 + \Upsilon_{1f} Y_{hj}^{k} + \Upsilon_{2l} a_{hj}^{k} + \mu_{hj}^{k} \quad (8)$$

The wage equation is, where w is the annual wage and X is an individual's characteristics, such as age, gender, marital status, education, employment status, number of hours worked, and the industry in which they work. In the rent equation, r is the annual rent paid and Y denotes housing characteristics, specifically the tenure status of the residence, type of wall, the broadest types of roof, the most overall type of floor, and floor area. We address the changes in the value of amenities by including a discount rate. Several studies have used household rental variables calculated by multiplying the rental value by the annual discount rate (Berger et al. 2008, Hand et al. 2008, Koirala–Bohara 2014). We divided the amenities into 10 categories: health, education, recreation, sports, economy, communication, crime, security, transportation, and nature. These were represented by 29 independent variables, the information on which were available from PODES. We used the ordinary least squares method to estimate both equations. Tables A1 and A2 in the Appendix contain information on variable descriptions and mean values.

Third, the annual household compensation value was calculated for each amenity in city *k*. In the wage equation, we can calculate the value of the yearly household compensation for each amenity in city *k* by multiplying the value of the amenity regression coefficient by the average number of household members in city *k* and the average wage in city k. In the rental equation, we can calculate the value of the annual

[2] SUSENAS data is the source of data from a survey designed to collect very broad population social data. Education, health/nutrition, housing, other socioeconomic activities, socio-cultural activities, household consumption/expenditures and income, travel, and public opinion about their household welfare are among the data collected.

household compensation for each amenity in city *k* by multiplying the value of the amenity regression coefficient by the average rent in city *k*.

The fourth step was to compute the index. We first calculated the implicit prices of the amenities index, which can be expressed as the total sum of the equilibrium differential of rent and wages, which varies with each unit change in city amenities. In another formulation, the implicit price is the value of compensation paid by households in city *k* per year for each amenity in this city from the housing market, less the value of compensation paid by households in city *k* per year for each amenity in city *k* from the labour market. The difference between the balance of wages and rent, f_k, is used to calculate the implicit price of amenities, as in equation (5). Thus, we can calculate the urban amenities index for each city by adding the product of the implicit price *l* and the average value of amenities *l* once the price of implicit amenities is obtained. This index represents the implicit price that households and people must pay to enjoy the city's amenities through the housing and labour markets. In the context of migration, households or individuals who relocate to a city forego income in the early phases of their relocation to pay for amenities, increasing their utility by consuming the city's amenities.

By selecting a base city, we intend to show an index of urban amenities that can be compared. According to Berger et al. (2008), the base city has the lowest amenities index value; as a result, we receive a positive urban amenities index value or we can obtain the absolute value of the urban amenities index for each city. The city ranking was not affected by this method. Tables A3 and A4 in the Appendix present the complete results of the calculations.

Empirical model

Based on the urban amenities index, we can see which cities are more attractive, more comfortable, and preferable than the others. To build the empirical model, we used empirical models from various prior studies and modified them to fit our need to examine the relationship between amenities and migration, as follows.

$$\text{inmig} = \gamma_1 + \gamma_2\ \text{amein} + \gamma_3\ \text{G} + \text{e} \qquad (9)$$

where inmig is the number of people who move to a city in a given year (inmig); we use the in-migration data from the Central Bureau of Statistics as the dependent variable. The scope of migration in this study is recent migration based on the place of residence five years ago, that is, the place where an individual lives at the time of enumeration is different from where they lived five years ago. Data for the dependent variables are available for 2010 and 2015. To meet the characteristics that describe the conditions of recent migration, the independent variable data for five years before the data on recent migration were collected.

The independent variables consisted of amenities and the control variables. We classified amenities into three categories: public, natural, and social amenities. Health,

education, recreation, sports, economy, communication, security, and transportation were included in the public facilities category. We proxy natural amenities from coastal locations and outside forest areas and social amenities from crime incidents in the form of robbery and violence. G is a control variable consisting of the population density per square kilometre (density) and distance to the airport in kilometres (airport distance). We measured both variables during the same period as independent variables. For the airport variable representing access to entering the city, easier and available airport access can encourage people to migrate (Buch et al. 2014). The population density variable represents the intensity of economic activity, and a city with high population density can become a centre of economic activity (Etzo 2011).

Results

The regional pattern of the urban amenities index

The cities in Java and Bali had the highest average urban amenity index values. This finding indicates that city amenities in Java and Bali are more attractive, better, and complete than cities in other regions. Cities in the provinces of West Nusa Tenggara, East Nusa Tenggara, Maluku, North Maluku, Papua, and West Papua have the lower mean value than that in other regions such as cities in Java & Bali, Sumatera, and Kalimantan. The Sumatera region has the most extensive variation in the urban amenities index between regions, whereas the Kalimantan region has the least. This finding also informs us whether the city amenities in Java and Bali support the development of the industrial, financial, and service sectors, as well as a more advanced socio-cultural life than those in other islands. These cities have relatively more complete educational and health facilities and recreational variety, higher development of transportation and communication technologies, and better security guarantees, all of which are an incentive for migration (Mantra 1992).

Table 1

The urban amenities index based on Indonesian region

Region	Number of cities	Average	Standard deviation	Region	Number of cities	Average	Standard deviation
	2006				2011		
Sumatera	31	31.0	17.7	Sumatera	34	29.3	22.9
Java & Bali	33	47.0	16.1	Java & Bali	35	53.5	19.8
Kalimantan	9	33.7	10.6	Kalimantan	9	40.1	17.5
Sulawesi	10	27.5	16.5	Sulawesi	11	33.4	20.6
Others	8	25.4	12.2	Others	9	24.9	18.4
All	91	36.2	17.8	All	98	39.0	23.3

Several cities in Sumatera and Kalimantan show relatively faster development, particularly the areas rich in natural resources, such as East Kalimantan, North Sumatera, North Sulawesi, and Riau. Cities here would attract migrants in response to the opportunities provided in natural resource exploitation (Firman 2015), which may be followed by the provision of amenities to support the activities of residents (Steinberg 1991). The variation in values of the urban amenities index for all cities in Indonesia was quite high compared to those of the cities on each island. This reflects the disparity in economic development between cities, with some growing rapidly and the others stagnating. Furthermore, development in large cities often ignores the strengthening of ties with smaller cities (Gardiner 1997). Providing amenities comes at a high expense, and most municipal governments rely on the central government's budget to build roads, health facilities, schools, markets, and other facilities. Therefore, the private sector needs to play a role when urban infrastructure can only be partially fulfilled by the government. The private sector converted rural areas into satellite cities and constructed suburban cities as buffers for metropolitan and large cities. They built these cities with many amenities such as private schools and health, shopping malls, and sports facilities. This has become a typical Indonesian city development process (Sujarto 2003).

Table 2

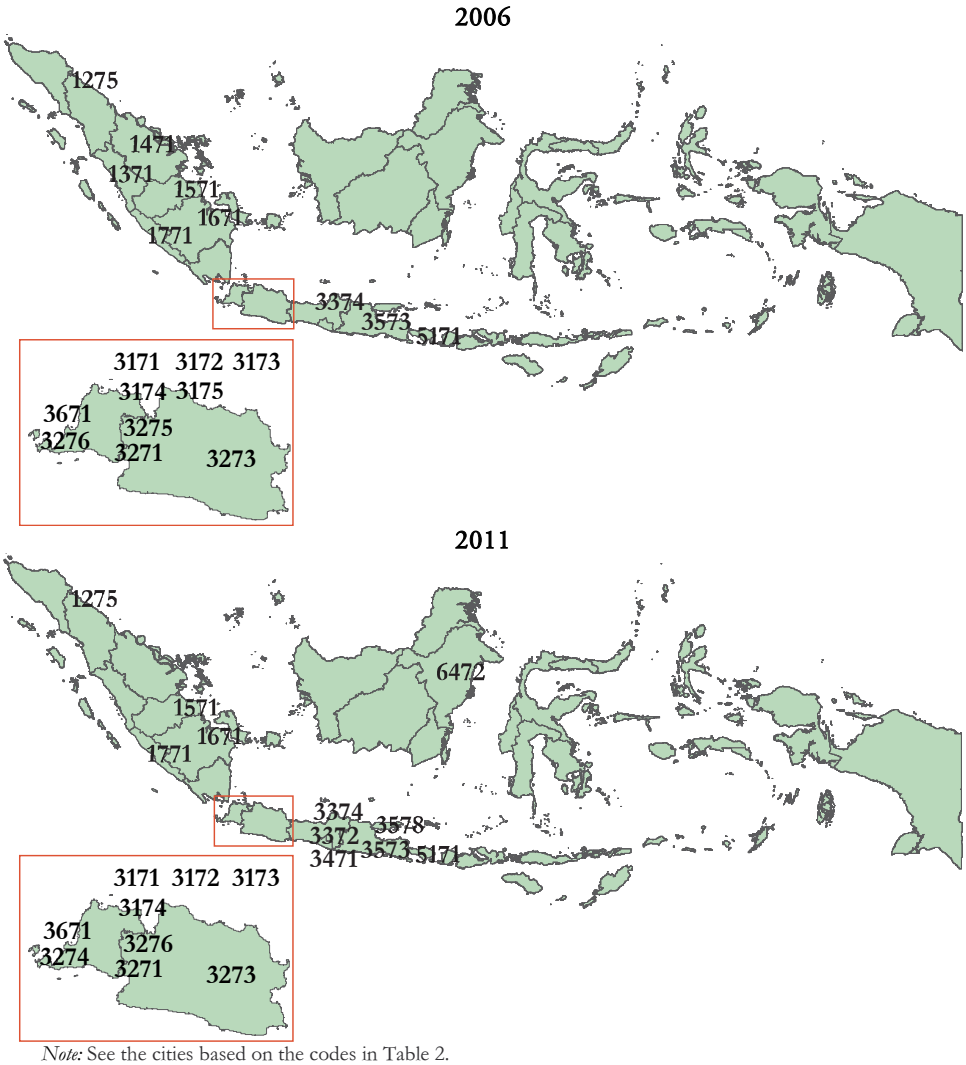
The urban amenities index for top 20 Indonesian cities

No	City Code	City	Value	No	City Code	City	Value
2006				2011			
1	3173	Central Jakarta	45.15	1	3171	South Jakarta	70.59
2	3171	South Jakarta	42.01	2	5171	Denpasar	66.36
3	5171	Denpasar	41.65	3	3173	Central Jakarta	55.78
4	3172	East Jakarta	41.64	4	3578	Surabaya	45.00
5	3273	Bandung	38.75	5	3471	Yogyakarta	44.29
6	3174	West Jakarta	37.07	6	3276	Depok	40.13
7	3276	Depok	36.77	7	3273	Bandung	39.67
8	3374	Semarang	36.47	8	1275	Medan	39.63
9	3671	Tangerang	36.40	9	3374	Semarang	39.20
10	3471	Yogyakarta	35.39	10	3573	Malang	39.13
11	3175	North Jakarta	35.24	11	3671	Tangerang	38.99
12	3271	Bogor	33.37	12	3674	South Tangerang	38.51
13	1275	Medan	33.18	13	1671	Palembang	38.31
14	1671	Palembang	32.42	14	3372	Surakarta	37.80
15	1571	Jambi	30.99	15	1771	Bengkulu	37.26
16	1771	Bengkulu	30.66	16	3174	West Jakarta	36.90
17	1371	Padang	30.60	17	1571	Jambi	36.88
18	3573	Malang	28.89	18	3271	Bogor	36.71
19	3275	Bekasi	28.70	19	6472	Samarinda	36.63
20	1471	Pekanbaru	28.09	20	3172	East Jakarta	36.44

The results of the calculated urban amenities index for the top 20 cities in 2006 and 2011 are presented in Table 2 and Figure 1. Cities in the island of Java are still the most appealing as they offer the most amenities in the top 20 cities category, namely 13 in 2006 and 14 in 2011. Central Jakarta, South Jakarta, West Jakarta, East Jakarta, Bandung, Depok, Bogor, Tangerang, Semarang, Yogyakarta, and Malang consistently ranked among the top 20 cities. Cities such as Medan, Palembang, Jambi, Bengkulu, and Denpasar, outside Java, were also consistently in the top 20 cities and provide tough competition in terms of liveability. In the table, the cities outside Java are typically provincial capitals, although not all cities in Java are capitals.

Figure 1

Indonesian cities in the top 20 cities' urban amenities index



Note: See the cities based on the codes in Table 2.

Central Jakarta had the highest urban amenities index in 2006, while South Jakarta had the highest urban amenities index in 2011. During the same period, the Indonesian Central Statistics Agency (2012) reported that central Jakarta had the highest population density. Affordability and accessibility were related to amenities and density. The population densities and amenities of cities may vary. Amenities can be capitalised into housing prices, but this is often insufficient to compensate for the wages earned by residents. In addition, densely populated areas are not always accompanied by sufficient amenities (Rappaport 2008). Consequently, areas with the highest population density, such as Central Jakarta, have the potential to experience difficulties in obtaining and accessing amenities. Households that may give preference to amenities ratings tend to be few in number.

Cities in the Special Capital Region of Jakarta, such as Central Jakarta, North Jakarta, East Jakarta, South Jakarta, and West Jakarta, are not only metropolitan cities and capital cities, but also centres for trade, industry, education, health, recreation and social services, and models of communication services (Mulyana 2014). This accumulation of functions creates a huge attraction for residents from other areas (Zimmerman 2010). Furthermore, Indonesian cities are moving toward a more integrated and dispersed city system. The development of cities in Indonesia tends to create a mega-urban phenomenon, such as Jakarta–Bogor–Depok–Tangerang–South Tangerang–Bekasi, known as Jabodetabek (Firman 2017). The development of cities outside Jakarta can encourage the property sector to develop, resulting in the construction of supporting infrastructure and allowing people to live outside the Jakarta area. This condition presents a commuter mobility pattern in the Jabodetabek area, necessitating the availability of transportation facilities that are simple, inexpensive, comfortable, reliable, and safe (Dharmapatni–Firman 1995). With increasing urbanisation, as people move from big cities to suburbs, it results in commuting activities as a form of non-permanent migration. Most of these activities do not discriminate based on gender; both men and women can participate (Ananta–Arifin 2008).

Apart from Jakarta, the polarisation of development in Indonesia is seen in several big cities, such as Surabaya, Bandung, Medan, Palembang, and Semarang. Owing to developments in the industrial, financial, trade, and service sectors, these cities continue to grow, become migrant destinations, and encourage the development of amenities such as schools, health facilities, recreational facilities, entertainment, shopping centres, hotels, and others (Hogan–Houston 2001). Small towns in Central and East Java are frequently used as collection and distribution points of goods. In addition, they are inhabited by a large number of retired civil servants and the elderly, earning them the name of 'City of Pensions' (Titus 1993, Firman et al. 2007). There are also cities that are not categorised as big cities or medium cities but have national significance, such as Surakarta, Yogyakarta, and Malang. According to Rechnitzer et al. (2019), these cities are comparable to large cities because they typically serve

specific functions, such as being network nodes and offering connectivity between regions. Furthermore, these cities are home to the branch offices of major corporations, a centre for research and development, and universities.

Outside Java, there has been rapid development of cities such as Pekanbaru, Jambi, and Samarinda. These cities have the ability to attract migrants, particularly labourers (Mantra 1992). They already have standard urban infrastructure and amenities such as roads, sewers, schools, medical facilities, security personnel, open spaces, and greenery. Cities in natural resource-rich areas, such as Riau and East Kalimantan Province, have complete infrastructure and city amenities that are often better than those of medium and small cities in Java (Dieleman 2011). Small and medium-sized cities outside Java serve as economic hubs for natural resource-based industries, such as oil, mining, palm oil, and timber (Fahmi et al. 2014, Firman 2015). Small cities should invest in the development of amenities that support city development and the local economy in the future. These cities should not rely on the availability of labour absorbed by manufacturing sector firms because firms will always consider relocating factories to areas with cheaper labour to compete globally. Furthermore, cities with a specific heritage site must consider developing adequate tourism infrastructure to serve visitors (Atkinson 2019). The special regions of Yogyakarta and Bali are important tourist destinations in Indonesia. Yogyakarta is known as the 'Student City' and Denpasar is a tourist destination for visitors to Indonesia. This will encourage the regional government to build supporting facilities and infrastructure, potentially increasing the demand for amenities in both areas.

Relationship between migration and the urban amenities index

We conduct an empirical test to examine the effect of amenities on migration at the city level. This study's scope is recent in-migration (five years), as explained earlier. The dependent variable was recent in-migration. To meet the characteristics that describe the conditions of recent migration, the independent variable is data for five years before the data on the recent migration. Because we use SUSENAS and PODES data published simultaneously, to obtain the urban amenities index, we include the discount rate in the amenities calculation to account for the monetary value of amenities. This method has been applied by other scholars such as Berger et al. (2008), Hand et al. (2008), and Koirala–Bohara (2014). We assume that data from the independent variables over the last five years would affect the recent in-migration data. In Table 3, we present two models: the first focuses on in-migration in 2010 in 91 cities, excluding cities separated from the parent regencies, and the second focuses on in-migration in 2015 in 98 cities, including cities separated from parent regencies such as Serang, South Tangerang, Sungai Penuh, Gunung Sitoli, Subulussalam, Kotamobagu, and Tual.

The empirical estimation results are given in Table 3. We find that amenities significantly affect in-migration to Indonesian cities. Amenities are important in

domestic migration because they represent characteristics that tend to be concentrated, relating to demographic trends in an area, and able to improve the lives of city residents (Michalkó et al. 2011). The amenity group for public facilities has a positive effect and can attract more migrants into a city. Cities with equipped with better amenities will be attractive to migrants because they relocate searching for high-quality amenities (Yu et al. 2019). Furthermore, individuals who move to cities frequently bring their families, thereby increasing family migration, and increasing the population of migrant children and in turn the demand for public services such as education and health (Li et al. 2018). In Indonesia, the city government has provided these facilities and citizens can access them freely, provided they have an identity card and a family card with a current address in a city. However, Indonesia's economic development continues to show inequality in education, health, public transportation, and other public services (Kawamura 2018). The importance of equal access to basic public service facilities must be prioritised because accessibility to these facilities, such as schools and hospitals, can reduce inequality, provide better economic impact, improve citizens' quality of life, and lead to equitable development between cities (Grubesic–Durbin 2017, Lee–Miller 2018, Kelobonye et al. 2019, Fasihi–Parizadi 2020).

Table 3

Regression output: Amenities and in-migration

INDEP	Model 1		Model 2	
	Coef.	Sign.	Coef.	Sign.
Public facility	1 812.87	***	941.88	***
Nature	1 340.23	***	1 334.16	***
Social	–823.27		–730.38	**
Density	3.03	*	3.24	**
Airport distance	–107.92	**	–13.96	
Constant	19 328.37	***	13 143.93	***
N	91		98	
F	15.32		17.11	
Prob F	0.00		0.00	
R-Sq	0.58		0.54	

Public transportation services require government attention because they are linked to community mobility and daily commuting activities. Lack of opportunities to obtain transportation facilities can hinder accessibility and reduce social inclusion in the community (Berg–Ihlstrom 2019). Public transportation is a development goal because it promotes community development. As it is used by citizens and subsidised by the government, public transportation must be an important factor in ensuring increased welfare (Stjernborg–Mattisson 2016). The most important form of public transport is non-permanent migration, usually work-related migration. Citizens travel

daily, weekly, or over short or long distances. For those living in suburban cities, public transportation can be an option for overcoming immobility (Alpek et al. 2018). Public transportation services need to be developed by the city government, because they play an important role in expanding accessibility and help tourism, which can become a reference destination for recreation (Tóth et al. 2013). Furthermore, it encourages population concentration, which is a prerequisite for capital and investment inflows to a city to increase its competitiveness (Szabó 2019).

A public transportation system was developed in the Jabodetabek area to connect Jakarta (Indonesia's capital city) with its supporting cities, such as Bogor, Depok, Tangerang, South Tangerang, and Bekasi. The system has various modes of transportation, such as bus rapid transit (BRT), light rapid transit (LRT), mass rapid transit (MRT), and commuter lines (Farda–Lubis 2018). The government must construct a proven and sustainable public transportation system to reduce the daily traffic jams that occur during the week, resulting in increased greenhouse gas emissions and lost travel time (Afrin–Yodo 2020). Other city governments in Indonesia have responded by providing bus rapid transit. This transportation service is commonly referred to as 'Trans'; besides Trans Jakarta, there are Trans Jogja (Yogyakarta), Batik Solo Trans (Surakarta), Trans Semarang (Semarang), Trans Pakuan (Bogor), Trans Metro Bandung (Bandung), Trans Musi (Palembang), Trans Metro Pekanbaru (Pekanbaru), Trans Sarbagita (Denpasar), Trans Padang (Padang), and Trans Mamminasata (Makassar).

Natural amenities in urban areas can serve as attractive interaction spaces and recreational zones for the community. These amenities can attract cities and people to live in areas close to nature, and the environmental conditions of settlements affect changes in land prices (Tánczos-Szabó 2019). Moreover, natural amenities can spur urban growth in cities not classified as metropolitan (Rickman–Wang 2017). Our findings show that natural amenities positively affect in-migration. Since they can be recognised as public land that city residents can use for particular purposes, such as recreation, ensuring that their presence does not limit accessibility. They may not positively affect in-migration if the set of natural amenities factors cannot provide accessibility (Chi–Marcouiller 2013). Furthermore, most Indonesian migrants are from rural areas (CBS 2010). They may appreciate natural amenities more than the suburban regions or areas that fall into the city category. However, migrants may give different ratings to natural amenities when they live in areas adjacent to cities or regions that are not classified as cities (Isserman et al. 2009). When migrating to a new region, people in this category value natural amenities at the same level. In some areas, amenities compensate for wage differences. Therefore, people are willing to accept lower wages in exchange for natural amenities (Schmidt–Courant 2006).

We use social amenities in cities proxied by the presence of crime in the form of robbery and violence. We chose this variable because of the available information in PODES, even though the literature mentions other social amenities such as openness,

inclusivity, tolerance, and diversity. However, information about these characteristics is not available in PODES, which has limitations. Our findings show a negative relationship between social amenities and migration to cities. Migrants tend to be reluctant to enter cities known for crime. The empirical results support previous findings because crime is linked to fear and is negatively correlated with migration (Souza 2014). Lower crime-rate areas or regions frequently imply safety, encouraging people to live there (Clark et al. 2003). The insignificant social amenities variable may be because individuals or households have different perceptions of each type of crime (Romero 2014). They could move to an area with a high property crime rate but are reluctant to move to locations with a high rate of violent crime (Chairassamee 2018). According to PODES data, the average incidence of crime (robbery and violent) increased in 2011 compared to 2006. The Indonesian Statistical Agency's Crime Statistics 2011 stated that crimes of robbery and violence were the highest. Individuals and households pay close attention to such crimes because they have the potential to take lives. Compared to 2006, the Indonesian Statistical Agency's Crime Statistics informs that the most common type of crime was motor vehicle theft.

We include control variables such as population density and airport distance in our empirical model. The population density represents the intensity of economic activity. Our findings show that the population density variable is essential in urban migration because an increasingly dense city can become a centre of economic transformation, which encourages labour migration (Buch et al. 2014). Furthermore, a city with a high density indicates good human resources and better amenities (Glaeser–Shapiro 2003). Recent migration into cities, widely spread across islands throughout Indonesia, is influenced by the distance between the islands (CBS 2010). The airport can serve as a gateway to the city, and we proxy it using the distance to the airport in this study. Our findings are not significant for certain model. However, migrants value the presence of an airport because it serves as a long-distance transit hub that connects origin and destination areas (Etzo 2011, Buch et al. 2014).

Conclusion

What makes cities appealing and liveable is the adequate availability of amenities. City amenities make people's lives comfortable and encourage them to relocate to specific locations. However, studies linking amenities and migration are limited and do not adequately represent the situation in developing countries. Furthermore, the three major types of amenities (natural, social, and public facility), especially as non-market goods, have received little attention. In contrast to the extant literature, in this study, we calculate the implicit price of amenities as an approximation for non-market goods and measure the urban amenities index by accommodating the three major amenities groups. We also examine the link between amenities and migration using Indonesian cities as a case study.

Our study found several cities with a high level of amenities in and outside Java. Cities in Jakarta's Special Capital Region show a high urban amenities index owing to their status as metropolitan and capital cities. Consequently, these cities have good amenities and a pleasant urban environment to support them, and exert a strong pull on residents from other areas. In addition, the development of cities in Indonesia tends to generate mega-urban cities, resulting in a need for building supporting amenities and urban infrastructure. This condition can cause a commuter mobility pattern in the form of non-permanent migration.

Several cities in and outside Java, such as Surabaya, Bandung, Semarang, and Medan, have high urban amenities indices. These cities attract migrants because they have developed their industrial, financial, trade, and service sectors. Cities outside Java, such as Pekanbaru, Jambi, and Samarinda, have been developing rapidly because they include natural resource-rich areas, and attract migrants as well. These cities are equipped with amenities such as schools, health facilities, recreational facilities, entertainment, shopping centres, and hotels, which are often better than those of medium and small cities on Java.

The migrants are attracted to cities because they value complete, better, and high-quality public facilities. Public facilities can promote equality, improve quality of life, and promote equitable urban developments. Natural amenities too, encourage people to move to cities, which then have the potential to be an appealing interaction space and recreation zone for communities. Social amenities, proxied by crime, reduce people's desire to come and live in a city. Although perceptions of crime differ, areas or regions with lower crime rates frequently represent security, which attract and encourage people to live there.

Our findings provide suggestions for city governments to consider adequate provision of amenities when designing policies for city development. Amenities encourage residents to enjoy city life while complementing urban development. However, this study has a few limitations. It suffered from limited access to relevant and matching PODES and SUSENAS data. Additionally, PODES data were limited in scope in terms of indicators of social and natural amenities. We hope that future studies use or combine more sources to obtain data on additional social and natural amenities.

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Appendix

Table A1

Variable description and average value on the wage equation

Dependent variable	Description	2006	2011
Wage	Total annual earnings in the form of money and goods received by an individual (IDR)	13,929,636	21,800,000

Explanatory variable		Description	2006	2011
Individual information	age	Age	28.089	37.629
	male	Dummy variable for gender	0.498	0.494
	marital stat	Marital status	0.439	0.634
	no primary school	Dummy variable that shows whether or not the individual has not finished primary school	0.187	0.086
	secondary high school	Dummy variable that shows whether or not the individual has finished secondary high school	0.160	0.208
	senior high school	Dummy variable that shows whether or not the individual has finished senior high school	0.261	0.362
	university	Dummy variable that shows whether or not the individual has finished university	0.073	0.133
	workmainstat	The individual's main employment status	0.203	0.334
	secondary sector	Working in the secondary sector	0.036	0.118
	tertiary sector	Working in the tertiary sector	0.261	0.426
Health	hospital	Number of hospitals	0.233	1.218
	matern_hospital	Number of maternity hospitals	0.640	1.917
	com_healtcent	Number of community health centres	0.411	1.131
	doctors	Number of doctors	5.291	5.743
	regishealthnurse	Number of registered health nurses	2.088	6.033
	midwife	Number of midwives	3.433	4.978
Education	elementary school	number of elementary schools	6.096	5.798
	primary school	Number of primary high school	1.859	1.992
	senior high school	Number of senior high school	1.725	1.836
	university	Number of universities	0.537	0.567
Recreation	cinema	Dummy variable for cinema	0.044	0.031
	hotels	Number of hotels	0.879	0.857
Sport	dfootballfield	Dummy variable for football field	0.555	0.484
	dvolleyballfield	Dummy variable for volleyball field	0.881	0.752
	dbadmintonfield	Dummy variable for badminton field	0.799	0.712
Economy	market	Dummy variable for market	0.354	0.357
	modern market	Number of modern markets	1.120	2.692
Communication	cable phone	Number of families who have a telephone cable	13.839	12.274
	phone rent	Dummy variable for telephone rental	0.843	0.480
	internet rent	Dummy variable for internet rental	0.773	0.872

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Explanatory variable		Description	2006	2011
Crime	robbery	Dummy variable for robbery crime	0.097	0.645
	violent	Dummy variable for violent crime	0.148	0.207
Security	civil officer	Number of civil security officers	36.456	33.415
	civil post	Dummy variable for civil security officer post	0.943	0.884
	police post	Dummy variable for police officer post	0.389	0.390
Transportation	public transportation	Public transportation with fixed route	0.872	0.726
	four-wheel transport	Public transportation for four or more wheels	0.686	0.751
Nature	coast	Dummy variable for close to the coast	0.157	0.152
	forest	Dummy variable for outside the forest area	0.938	0.945

Table A2

Variable description and average value on the rent equation

Dependent variable	Description	2006	2011
rent	Total rent paid in a year (IDR)	3,248,018	5,048,593

Explanatory variable		Description	2006	2011
Housing information	ownership	Dummy variable for home ownership	0.629	0.636
	roof	Dummy variable for the widest type of roof is concrete/tile/shingle	0.488	0.458
	wall	Dummy variable for houses with walls	0.752	0.804
	floor	Dummy variable for the widest type of floor is marble / ceramic / granite	0.944	0.804
	housearea	Size of the house in square meters	72.325	72.195
Health	hospital	Number of hospitals	0.237	1.217
	matern_hospital	Number of maternity hospitals	0.649	1.908
	com_healtcent	Number of community health centres	0.414	1.131
	doctors	Number of doctors	5.428	5.830
	regishealthnurse	Number of registered health nurses	2.053	6.030
	midwife	Number of midwives	3.392	4.969
Education	elementary school	Number of elementary schools	6.169	5.813
	primary school	Number of primary high school	1.882	1.997
	senior high school	Number of senior high school	1.750	1.847
	university	Number of universities	0.544	0.586
Recreation	cinema	Dummy variable for cinema	0.045	0.032
	hotels	Number of hotels	0.926	0.896
Sport	dfootballfield	Dummy variable for football field	0.559	0.490
	dvolleyballfield	Dummy variable for volleyball field	0.884	0.756
	dbadmintonfield	Dummy variable for badminton field	0.806	0.717

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Explanatory variable		Description	2006	2011
Economy	market	Dummy variable for market	0.363	0.364
	modern market	Number of modern markets	1.146	2.747
Communication	cable phone	Number of families who have a telephone cable	14.148	12.394
	phone rent	Dummy variable for telephone rental	0.849	0.487
	internet rent	Dummy variable for internet rental	0.803	0.876
Crime	robbery	Dummy variable for robbery crime	0.097	0.647
	violent	Dummy variable for violent crime	0.148	0.207
Security	civil officer	Number of civil security officers	37.696	34.417
	civil post	Dummy variable for civil security officer post	0.947	0.890
	police post	Dummy variable for police officer post	0.392	0.395
Transportation	public transportation	Public transportation with fixed route	0.874	0.727
	fourwheels transport	Public transportation using four or more wheels	0.691	0.755
Nature	coast	Dummy variable for close to the coast	0.151	0.152
	forest	Dummy variable for outside the forest area	0.939	0.945

Table A3

Indonesian urban amenities index for 2006

City code	City	Value	City code	City	Value
1171	BANDA ACEH	42.04	1571	JAMBI	58.22
1172	SABANG	8.70	1671	PALEMBANG	59.65
1173	LANGSA	25.59	1672	PRABUMULIH	20.45
1174	LHOKSEUMAWE	31.51	1673	PAGAR ALAM	14.93
1271	SIBOLGA	15.04	1674	LUBUKLINGGAU	31.90
1272	TANJUNG BALAI	12.24	1771	BENGKULU	57.90
1273	PEMATANG SIANTAR	21.91	1871	BANDAR LAMPUNG	45.62
1274	TEBING TINGGI	11.77	1872	METRO	13.88
1275	MEDAN	60.41	1971	PANGKAL PINANG	17.58
1276	BINJAI	15.54	2171	BATAM	55.1
1277	PADANGSIDIMPUAN	18.07	2172	TANJUNG PINANG	19.67
1371	PADANG	57.83	3171	SOUTH JAKARTA	69.24
1372	SOLOK	18.11	3172	EAST JAKARTA	68.87
1373	SAWAH LUNTO	21.60	3173	CENTRAL JAKARTA	72.38
1374	PADANG PANJANG	19.32	3174	WEST JAKARTA	64.30
1375	BUKITTINGGI	50.66	3175	NORTH JAKARTA	62.47
1376	PAYAKUMBUH	19.07	3271	BOGOR	60.60
1377	PARIAMAN	22.26	3272	SUKABUMI	31.82
1471	PEKANBARU	55.32	3273	BANDUNG	65.98
1473	DUMAI	39.58	3274	CIREBON	43.19

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City code	City	Value	City code	City	Value
3275	BEKASI	55.94	5371	KUPANG	29.67
3276	DEPOK	64.00	6171	PONTIANAK	42.24
3277	CIMAHI	42.56	6172	SINGKAWANG	22.63
3278	TASIKMALAYA	36.65	6271	PALANGKA RAYA	29.18
3279	BANJAR	24.98	6371	BANJARMASIN	46.06
3371	MAGELANG	32.90	6372	BANJAR BARU	17.94
3372	SURAKARTA	34.93	6471	BALIKPAPAN	45.50
3373	SALATIGA	34.45	6472	SAMARINDA	41.49
3374	SEMARANG	63.71	6473	TARAKAN	33.83
3375	PEKALONGAN	29.83	6474	BONTANG	24.66
3376	TEGAL	32.90	7171	MANADO	37.38
3471	YOGYAKARTA	62.62	7172	BITUNG	12.83
3571	KEDIRI	46.47	7173	TOMOHON	0.00
3572	BLITAR	34.20	7271	PALU	45.49
3573	MALANG	56.12	7371	MAKASSAR	47.12
3574	PROBOLINGGO	31.42	7372	PARE-PARE	21.92
3575	PASURUAN	28.18	7373	PALOPO	28.62
3576	MOJOKERTO	33.48	7471	KENDARI	42.11
3577	MADIUN	27.88	7472	BAU-BAU	7.16
3578	SURABAYA	48.34	7571	GORONTALO	32.49
3579	BATU	22.47	8171	AMBON	22.25
3671	TANGERANG	63.63	8271	TERNATE	33.96
3672	CILEGON	36.06	8272	TIDORE KEPULAUAN	12.04
5171	DENPASAR	68.89	9171	SORONG	17.28
5271	MATARAM	49.90	9471	JAYAPURA	16.58
5272	BIMA	21.13			

Note: Tomohon as the base city.

Seven cities were not considered because they are still part of the main regency: *South Tangerang* (split from Tangerang Regency in 2008), *Serang* (split from Serang Regency in 2007), *Sungai Penuh* (split from Kerinci Regency in 2009), *Gunung Sitoli* (split from Nias Regency in 2008), *Subulussalam* (split from Aceh Singkil Regency in 2007), *Kotamobagu* (split from Bolaang Mongondow Regency in 2007), and *Tual* (split from Southeast Maluku Regency in 2007).

Table A4

Indonesian urban amenities index for 2011

City code	City	Value	City code	City	Value
1171	BANDA ACEH	54.12	3271	BOGOR	61.63
1172	SABANG	9.40	3272	SUKABUMI	31.87
1173	LANGSA	17.48	3273	BANDUNG	64.59
1174	LHOKSEUMAWE	34.97	3274	CIREBON	60.52
1175	SUBULUSSALAM	3.91	3275	BEKASI	57.65
1271	SIBOLGA	16.45	3276	DEPOK	65.05
1272	TANJUNG BALAI	11.97	3277	CIMAHI	57.50
1273	PEMATANG SIANTAR	19.57	3278	TASIKMALAYA	32.22
1274	TEBING TINGGI	14.81	3279	BANJAR	29.07
1275	MEDAN	64.55	3371	MAGELANG	29.46
1276	BINJAI	12.74	3372	SURAKARTA	62.72
1277	PADANGSIDIMPUAN	7.18	3373	SALATIGA	51.78
1278	GUNUNGSITOLI	2.69	3374	SEMARANG	64.12
1371	PADANG	60.47	3375	PEKALONGAN	27.27
1372	SOLOK	15.59	3376	TEGAL	29.02
1373	SAWAH LUNTO	16.78	3471	YOGYAKARTA	69.21
1374	PADANG PANJANG	17.54	3571	KEDIRI	54.95
1375	BUKITTINGGI	56.91	3572	BLITAR	50.68
1376	PAYAKUMBUH	17.28	3573	MALANG	64.05
1377	PARIAMAN	19.05	3574	PROBOLINGGO	26.36
1471	PEKANBARU	60.09	3575	PASURUAN	24.35
1473	DUMAI	56.72	3576	MOJOKERTO	27.26
1571	JAMBI	61.80	3577	MADIUN	26.33
1572	SUNGAI PENUH	5.19	3578	SURABAYA	69.92
1671	PALEMBANG	63.23	3579	BATU	25.56
1672	PRABUMULIH	11.48	3671	TANGERANG	63.91
1673	PAGAR ALAM	4.82	3672	CILEGON	35.33
1674	LUBUKLINGGAU	15.57	3673	SERANG	38.64
1771	BENGKULU	62.18	3674	SOUTH TANGERANG	63.43
1871	BANDAR LAMPUNG	56.46	5171	DENPASAR	91.28
1872	METRO	6.67	5271	MATARAM	58.60
1971	PANGKAL PINANG	16.33	5272	BIMA	21.09
2171	BATAM	56.53	5371	KUPANG	30.18
2172	TANJUNG PINANG	10.46	6171	PONTIANAK	55.54
3171	SOUTH JAKARTA	95.51	6172	SINGKAWANG	18.77
3172	EAST JAKARTA	61.36	6271	PALANGKA RAYA	22.99
3173	CENTRAL JAKARTA	80.70	6371	BANJARMASIN	59.60
3174	WEST JAKARTA	61.82	6372	BANJAR BARU	23.45
3175	NORTH JAKARTA	59.66	6471	BALIKPAPAN	55.75

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City code	City	Value	City code	City	Value
6472	SAMARINDA	61.55	7373	PALOPO	28.39
6473	TARAKAN	30.05	7471	KENDARI	53.90
6474	BONTANG	27.56	7472	BAU-BAU	29.31
7171	MANADO	39.20	7571	GORONTALO	33.03
7172	BITUNG	9.01	8171	AMBON	19.14
7173	TOMOHON	11.64	8172	TUAL	0.00
7174	KOTAMOBAGU	5.32	8271	TERNATE	42.84
7271	PALU	58.55	8272	TIDORE KEPULAUAN	6.80
7371	MAKASSAR	56.96	9171	SORONG	20.02
7372	PARE-PARE	27.83	9471	JAYAPURA	17.34

Note: Tual as the base city.

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