The Impact Of GDP, Unemployment And Inflation Rates On Measuring The Economic Efficiency For Megalopolises

Dr. Doaa Wafik[1] , Prof. Assem Tharwat[2]

[1]*Newgiza University (NGU), Egypt. doaa.wafik@ngu.edu.eg*
[2]*American University in the Emirates, UAE. Assem.tharwat@aue.ae*

Abstract:

Megalopolises or Megacities are urbanized conurbation lodging 10 or more million occupants. They are frequently the essential hubs for speculation in a nation and include the foremost family units. Some of the first Megacities popped up in the developed world, with New York being the first, in the 1950s. For businesses, megacities are critical because they concentrate resources, income and business opportunities. At the same time, the negative externalities they produce by excessive emissions or traffic congestion encourage urban problems and opportunities that need creative solutions to preserve economic attractiveness. The adverse externalities they create through excessive pollution or traffic congestion, concurrently fosters urban challenges and opportunities, which necessitate innovative solutions to maintain economic appeal. They are till the finish of time the cunning hubs for award in a mountain, right now try to pieces and gauge the gainful efficiency of urban communities in an advancement and perfect environment, from proof envelopment sentiment to fit out the see-saw that happened in 47 Megacities everywhere throughout the world. We commission antidote asseverate sources of info and yields to imagine the adroitness of advantage these assets; the meager piece contrasts in urban areas, where the efficient urban areas show satisfactory asset use,

Keywords: Megacities, data envelopment analysis, economic efficiency, developed countries, developing countries

I.   Introduction:

In Europe effectively seventy-two percentage of the populace living in cities. The development process has arrived at stop and a procedure of dis urbanization and suburbanization brought about by a great pace of mechanization joined through success and the improvement of traffic and correspondence framework is recognizable. As per the of 2007 report by the State of World Population, and 2018 report from the United Nations 2018 [United Nations Population Fund (UNFPA) (2007)] without precedent for mankind's history the greater part of the total populace will be living in urban zones. While in created nations, urbanization has for the most part occurred in the second 50% of the nineteenth period, creating nations are presently on the center of their city development nowadays.
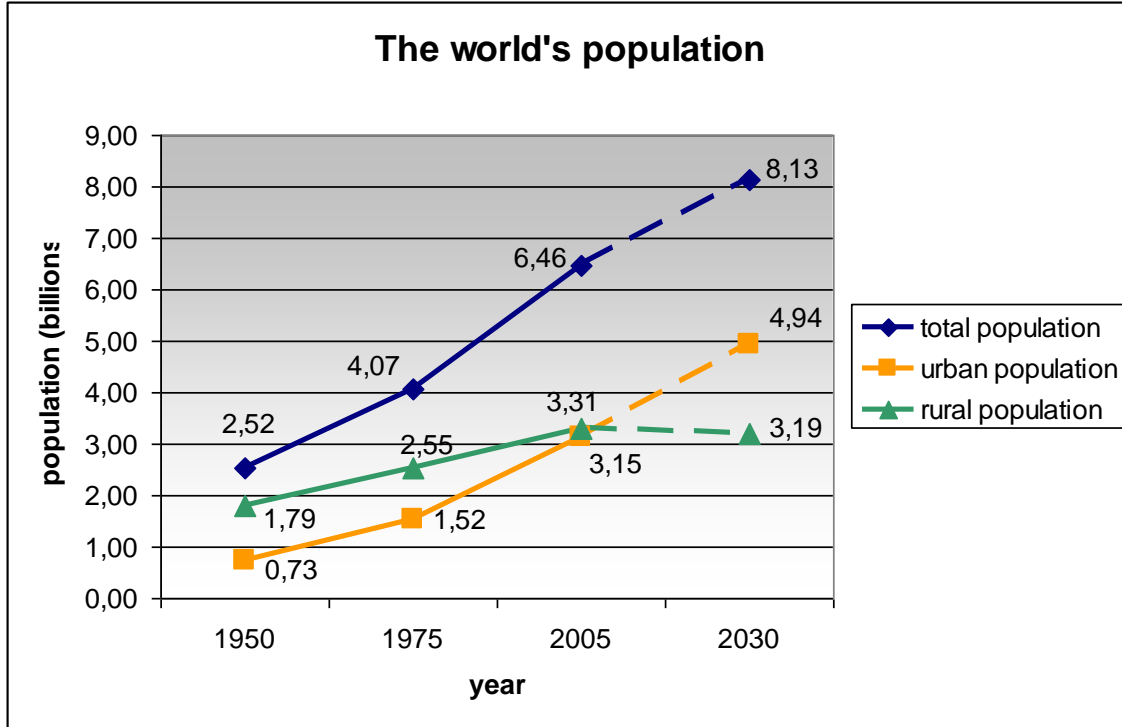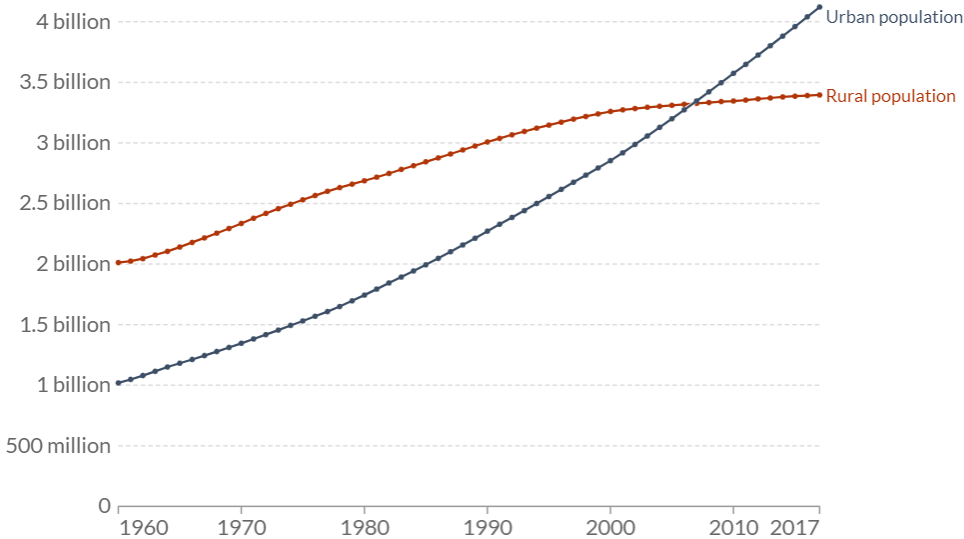
The world's population

Figure 1a: Urbanization across the world today

Number of people living in urban and rural areas, World

Source: World Bank based on data from the UN Population Division   OurWorldInData.org/urbanization • CC BY
Note: Urban populations are defined based on the definition of urban areas by national statistical offices.

Figure 1b: Urbanization across the world today

For instance, the Eastern African States Burundi and Rwanda have normal yearly populace development paces of more than 6 %. A high birth rate joined a growing movement from the

provincial zones strengthened by the alleged "push-factors" (joblessness, small norms in lodging, foundation, and lack of instructive offices) and "pull-factors" (conservative chances, appealing occupations, better training, present day way of life) prompts this dynamic development process.

The motivation behind that the Cities accumulations and municipal territories just as per megacities derive into the universal focal point of strategy and knowledge are their genuine effects in the worldwide condition, for example, the colossal land utilization, air contamination, water shortage, destitution, social isolation and weakness.

By means of the various nationwide and universal systems and investigation exercises in development and mega cities appear, there is an undeniable requirement aimed at extra and better city improvement procedures, lengthy haul land-living strategy and mighty city administration. [Bugliarello 1994, World Bank 1995, World Resources 1996, World Health Organization 2020, Worldometers 2020]

II.   Plotting the World Innovative Megacities in 2030

Facts suggest that a large number of such mega-city areas have been communities around the world for a long time. We are now entering a time when new mega-city areas spring up each other year, even those with less familiar names and histories.

The Megacity Landscape
The landscape is based around thirty-nine megacities predictable in 2030, which determination host nine percent of the world 's inhabitants in addition donate fifteen percent of the creation 's Gross domestic production. This corresponding megacity would account for around 3% of the world's land mass.

New Megacity by 2030
Fig 2 & 3 show that, a little more than 10 years starting nowadays, there willpower 5 innovative Megacities on creating nations, besides one as of a created showcase: Baghdad Iraq's greatest city as of now has near 8 million occupants, yet by 2030, it will find a good pace digits on account of its amazing populace development rate. Also, Bogotá the high-elevation Colombian principal will join the sites of other Latin American megacities, among 2017/2030, metropolitan drive to build its occupants via sixty percent – however it willpower in any case be no place as large as Cairo, that will be Africa highest Megacity by 29.9 m individuals. Dar el Salaam The greatest crowded town on Tanzania is developing nearly as per quick as Luanda and what's more, this one has the quickest developing (and littlest) Gross domestic production of the 6 fresh Megacities, Chicago the Stormy Urban has been in the point of Megacity scratch for quite a while, besides it will at long last success ten m. occupants on upcoming centuries.

On 2030, willpower through a wide margin the greatest Gross domestic production for entirely fresh Megacities, by 597 b. (constant 2017 prices). With such a significant number of individuals moving to urban metropolitan zones, the appearance of urban areas and their economies change every day. The Brookings Institute has another method for arranging these megacities, utilizing different monetary pointers. [United Nations Human Settlements Program 1996, 2004, United Nations. 1998. United Nations Development Program 2004, United Nations Office for the Coordination of Humanitarian Affairs 2005, United Nations Population Division 2006, Index Mundi Homepage 2020, International Monetary Fund Homepage, 2020].

Figure 2a: Mapping the World's New Megacities in 2030.

Figure 2b: Mapping the World's New Megacities in 2030.

1. Worldwide Giants

They are centers for monetary markets and are portrayed by huge populaces and a high convergence of riches and ability.

These six urban communities are the world's driving monetary and money related focuses.

2. Asian Anchors

The six Asian Anchor urban communities are not as affluent as the Global Giants; notwithstanding, they influence properties, for example, framework network and capable workforces to pull in the most Foreign Direct Investment (FDI) out of some other metro gathering.

3. Developing Gateways

These 28 urban communities are enormous business and transportation center points for significant national and local markets in Africa, Asia, Latin America, and the Middle East.

While they have developed to arrive at center salary status, they fall behind other worldwide urban areas on many key seriousness factors, for example, GDP and FDI.

4. Manufacturing plant China
Despite the fact that Factory China shows a GDP development rate that is well better than expected, it neglects to arrive at normal degrees of advancement, ability, and network.

There are 22 second and third-level Chinese urban communities dependent on send out assembling to control monetary development and global commitment.

5. Information Capitals
These are 19 moderate sized urban areas in the U.S. what's more, Europe that are viewed as focuses of development, with world class investigate colleges creating skilled workforces.

6. American Middleweights
These 16 fair sized U.S. metro regions are moderately rich and house solid colleges, just as other stay foundations.

7. Universal Middleweights
Models: Vancouver, Melbourne, Brussels, Tel Aviv Exposure: The perspectives and assessments communicated right now those of the creators, and don't speak to the perspectives on equities.com. per users ought not consider proclamations made by the creator as formal proposals and ought to counsel their money related guide before settling on any venture choices.

III. The influences of Urbanization and Urban indicators on Megacities Management

In light of principle qualities for Megacities, the greatest significant markers are given on accompanying shares, solidity, and dynamism of growth, payment, substructure besides land-living tenancy, socioeconomics differences, threats and susceptibility, urban authority. The terms megacity or hyperactive city are additionally in some cases used to portray urban communities with in excess of 20 million individuals. Urbanization is frequently connected with financial aspects – expanded openings for work, a brought together market, better compensation and higher individual riches have every single brought individuals into urban communities. The United Nations as a metropolitan zone characterizes a megacity with a complete populace of on additional of ten million individuals. A megacity able to be a solitary city zone or else at least 2 city regions, which have developed to such a degree, that they currently structure one urban region.

IV. Methodology
In this study, the practical part includes the data collection from trusted websites, recognizing and selecting the variables (either the inputs or the outputs), implementing the DEA approach to assessing the megacities efficiency of highest population countries (DMUs). We identified 24 megacities of highest population in different 24 countries based on available data, the sample size within the current study is appropriate for applying the DEA analysis according to the used variables, as Cooper 2007, Golany 1989 suggested that the DMUs should be greater than twice the number of inputs and outputs within the DEA model, whereas Banker 1984&1989 and Cooper 2007 suggested that the DMUs should be greater than three times the number of inputs and outputs within the DEA model for the results to be reasonable and acceptable. In subsequent, the used models in this study are displayed together with their purpose. [Mourad 2019&2020, Shahwan 2020, Habib 2020].

V. Data Envelopment Analysis Approach

DEA is a mathematical programming approach, which can provide helpful information to assess and optimize the relative efficiency of comparable DMUs. It is a nonparametric approach, where no assumptions on the population data are restricting its usage. The well-known efficiency score for peer objects, which are the DMUs is the ratio of the weighted output to the weighted input. The introduced weights allow the possibility of considering multiple variables which are not necessarily of the same type. This strengthens the DEA method. For N comparable DMUs, let $\{x_{in}\}_{\{1 \le i \le m\}}$ represent the inputs for the n-th DMU, and $\{y_{jn}\}_{\{1 \le j \le s\}}$ represent its outputs. The score of efficiency can be calculated by disbanding the following formula for DMU:

$$e_n = \max_{(\mu,\nu)\in R_+^{m\times s}} \frac{\sum_{j=1}^s \nu_j y_{jn}}{\sum_{i=1}^m \mu_i x_{in}}, \quad \text{where} \quad \frac{\sum_{j=1}^s \nu_j y_{jn}}{\sum_{i=1}^m \mu_i x_{in}} \le 1 \quad \text{for} \quad n = 1,\ldots,N \tag{1}$$

where μ and ν are the vectors of the weights associated with the inputs and outputs [Charnes 1978, Emrouznejad 2018, Liu, Yue 2022]. The obtained fractional programming problem can be transformed into a linear one. However, one has to choose in advance the orientation. There are two available orientations either output-orientation or input-orientation model. The

Input-Oriented:

choice of the model orientations depends on the variables under investigation. The first is chosen in case the decision-makers have control on decreasing the inputs, whereas the output orientation is chosen in case they have a control on increasing the outputs while retaining the same input level. The two linear problems, which are known by multiplier forms, are:

Output-Oriented

$$\max_{(\mu,\nu)\in\mathbb{R}_+^{m\times s}} \sum_{j=1}^s \nu_j y_{jn}$$

$$\sum_{i=1}^m \mu_i x_{in} = 1$$

And

$$\sum_{j=1}^s \nu_j y_{jn} - \sum_{i=1}^m \mu_i x_{in} \le 0$$

$$\min_{(\mu,\nu)\in R_+^{m\times s}} \sum_{i=1}^m \mu_i x_{in}$$

$$\sum_{j=1}^s \nu_j y_{jn} = 1 \tag{2}$$

$$\sum_{j=1}^s \nu_j y_{jn} - \sum_{i=1}^m \mu_i x_{in} \le 0$$

In practice, following the fact that the number of DMUs (N) is much more than the number of variables ($m + s$), the dual of these problems are considered, so that fewer number of constraints

Input-oriented

$$e_n = \min_{\lambda\in\mathbb{R}_+^N}(\theta_n)$$

$$\sum_{j=1}^N \lambda_j x_{ij} \le \theta_n x_{in}, \quad i = 1,\ldots,m$$

$$\sum_{j=1}^N \lambda_j y_{rj} \ge y_{rn},$$

$$r = 1,\ldots,s$$

and

are obtained [Banker 1984&1989]. The accompanying duals, which are known by envelopment forms, are

Output-oriented

$$\frac{1}{e_n} = \max_{\lambda\in\mathbb{R}_+^N}(\theta_n)$$

$$\sum_{j=1}^N \lambda_j x_{ij} \le x_{in}, \quad i = 1,\ldots,m \tag{3}$$

$$\sum_{j=1}^N \lambda_j y_{rj} \ge \theta_n y_{rn},$$

$$r = 1,\ldots,s$$

where λ is the vector of the weights associated with the DMUs. [Banker 1984&1989]. added one constraint on the weight vector to be unit in $L^1(\mathbb{R})$. That is:

$$\sum_{j=1}^{N} \lambda_j = 1 \qquad (4)$$

- Comparative efficiency analysis has become important in industry such as banking, financial, air force, police force, education, etc.
- It is progressively recognized as an effective tool for measuring the performance and benchmarking.
- It can help managers to identify and remedy underperformance, and regulations to encourage efficiency and ensure that consumers benefit from the resulting efficiency gains.

VI.   DEA Analysis

In this section, the DEA results for measuring the performance of the megacities in 24 countries, with a population of more than 10 million, are stated and analyzed. As mentioned previously there are 47 cities, which located in 24 countries. In this study only 24 cities were selected to represent the 24 countries by choosing the city with the highest population in each of the six countries with more than one megacity [Mourad 2019&2020, Shahwan 2020, Habib 2020].

DEA Model Parameters – Input / Output:
Set of OUTPUTs
    1- Population
    2- Area
Set of INTPUTs
    1- GDP per Capita
    2- Unemployment Rate
    3- Inflation Rate

Implemented Scenarios:

The study adopted multi scenarios that are considered to indicate the influence of the variables under study on the performance of the healthcare systems and to identify the reason(s) of inefficiency for each DMU if needed. These scenarios are as follows

- Scenario 1. The input variables are the population and area, while the output variable is the per capita GDP.
- Scenario 2. The input variables are the population and area, while the output variable is the Unemployment rate.
- Scenario 3. The input variables are the population and area, while the output variable is the Inflation rate.
- Scenario 4. The input variables are the population and area, while the output variables are the per capita GDP and the Unemployment rate.
- Scenario 5. The input variables are the population and area, while the output variables are the per capita GDP and the Inflation rate.
- Scenario 6. The input variables are the population and area, while the output variables are the per capita GDP, the Unemployment rate and the Inflation rate.
- Scenario 7. The input variables are the population and area, while the output variables are the Unemployment rate and the Inflation rate

Table 1: Descriptive statistics analysis

Study parameters	Minimum	Maximum	Average	Median	Standard Deviation
Population (per million)	10,072.00	38,140.00	19,608.38	17,718.50	7,562.33
Area km2	203.00	17,174.00	3,760.46	1,579.50	4,462.06
GDP per Capita	1,482.40	62,784.60	15,482.43	8,097.20	17,927.97
Unemployment Rates	1.10	18.10	4.35	4.30	5.65
Inflation Rates	0.90	31.00	2.66	3.50	3.31

The data set refer that the average population was about 19,608 M in a range of 10,072 to 38,140 with a standard deviation of 7,562 and 50% of the selected megacities having population more than 17,700 M. The average area in thousands KM was about 3,760 in a range of 203 to 17,147 with a standard deviation of 4,462 and 50% of the selected megacities having area more than 1,579 thousands KM. The average GDP per capita in thousands USD was about 15,482 in a range of 1,482 to 62,784 with a standard deviation of 17,972 and 50% of the selected megacities having GDP per capita more than 8,097 thousand USD. The average Unemployment rate was about 4.35% in a range of 1.1% to 18.1% with a standard deviation of 5.65 and 50% of the selected megacities having unemployment rate more than 4.3%. The average of Inflation rate was about 2.66% in a range of 0.9% to 31% with a standard deviation of 3.31 and 50% of the selected megacities having Inflation rate more than 3.5%,

Based on the DEA output-orientation model for all Scenarios, reveals the relative technical efficiency results for 24 megacities. The DEA results were estimated via DEAP 2.1/Octave software. The results indicate that there is a relative efficiency in the performance of 4 megacities according to all scenarios. In addition, in table 2, the results show that the highest mean of relative efficiency for the 24 cities under investigation was about 60% according to the last scenario that involved all the variables, While the lowest mean of relative efficiency was about 39% according to the first scenario. Moreover, the mean of the relative efficiency for those scenarios that considering more than one output having almost the same efficiency levels [Deng 2021, Zheng 2021, Deng 2022, Chen 2022, Xia 2022] .

Table 2: Average Efficiency levels

Scenario	GDP per Capita	Unemployment Rate	Inflation Rate	GDP per Capita and Unemployment Rate	GDP per Capita and Inflation Rate	Unemployment Rate and Inflation Rate	GDP per Capita, Unemployment Rate and Inflation Rate
Average Efficiency level	39%	46%	54%	54%	58%	58%	60%

Following the above analysis, the investigated countries will be classified based on their calculated efficiency scores. According to the conduct DEA analysis there are five categories, as follows:

Category 1: Efficient Cities (Four Cities) with respect to all the assumed output scenarios, their efficiency levels 100% for each scenario.
Category 2: Efficient Cities (Five Cities) with respect the main criteria but inefficient to at least one criterion from the assumed output scenarios , their inefficiency levels between 13% and 97%
Category 3: Inefficient Cities (Five Cities) with respect to any of the assumed output scenario. The total inefficiency levels are less than 40% for each country.
Category 4: Inefficient Cities (Six Cities) with respect to any of the assumed output scenario. The total inefficiency levels are less than 80% for each country.
Category 5: Inefficient Cities (Four Cities) with respect to any of the assumed output scenario. The total efficiency levels are at most 20% for each scenario.

In the following section a detailed analysis is given for each category according to the included megacities

Category 1: Efficient Cities (4) "with respect to all the (7) assumed output scenarios" with efficiency levels 100% for each scenario.

As observed in table [3], the first three megacities Bangkok (Thailand), Bogotá (Colombia), Buenos Aires (Argentina) and Lima (Peru) are relatively efficient with a perfect level of inefficiency for all the investigated seven scenarios. The efficiency levels are 100% in each individual scenario, which means that these four cities are fully effectively, efficiently and optimally utilized their recourse to deal with the main economic challenges including the inflation rate and the unemployment rate, in addition they are contributed with their countries to obtain an optimal per capita according to their available resources.

Table 3: Category 1, Efficiency levels

City	Country	Efficiency Level of GDP per capita	Efficiency Level of Unemployment	Efficiency Level of Inflation	Efficiency Level of GDP per capita and Unemployment	Efficiency Level of GDP per capita and Inflation	Efficiency Level of Unemployment and Inflation	Efficiency Level of GDP per capita, Unemployment and Inflation
Bangkok	Thailand	100%	100%	100%	100%	100%	100%	100%
Bogotá	Colombia	100%	100%	100%	100%	100%	100%	100%
Buenos Aires	Argentina	100%	100%	100%	100%	100%	100%	100%
Lima	Peru	100%	100%	100%	100%	100%	100%	100%

Category 2: Efficient Cities (5) with respect the main criteria but inefficient to at least one criterion from the assumed output scenarios with inefficiency levels between 13% and 97% for the inefficient scenarios.

As observed in table [4], each city is relatively efficient with respect to the main criteria, while the inefficiency for Dhaka (Bangladesh) appears only in the per capita but the total efficiency was improved to be perfect since it is efficient for the other scenarios. In

addition, the other four countries Manila (Philippines), Kinshasa (DR Congo), Seoul (South Korea) and Paris (France) are efficient with respect to the main criteria and efficient with respect to other three criteria while it is inefficient with respect to the last three criteria.

Manila and Seoul are inefficient in per capita means the per capita less than the expectation according to the given resources, in the other hand Manila and Kinshasa are inefficient in the inflation rates which means they have higher rate than the expected based on the input parameter, moreover Kinshasa, Seoul and Paris are inefficient in the unemployment rates that is leading to the fact that the current rates are higher than the standard rates comparing with the relative efficient cities.

Table 4: Category 2, Efficiency levels

City	Country	Efficiency Level of GDP per capita	Efficiency Level of Unemployment	Efficiency Level of Inflation	Efficiency Level of GDP per capita and Unemployment	Efficiency Level of GDP per capita and Inflation	Efficiency Level of Unemployment and Inflation	Efficiency Level of GDP per capita, Unemployment and Inflation
Dhaka	Bangladesh	30.80%	100%	100%	100 %	100 %	100 %	100 %
Manila	Philippines	54.80%	100%	87.10%	100 %	87.10%	100 %	100 %
Kinshasa	DR Congo	100 %	53.80%	30.40%	100 %	100 %	53.80%	100 %
Seoul	South Korea	3.40%	28.60%	100%	28.60%	100 %	100 %	100 %
Paris	France	15.40%	25.30%	100%	25.30%	100 %	100 %	100 %

Category 3: Inefficient Cities (5) with respect to any of the (7) assumed output scenario. The total inefficiency levels are less than 40% for each country.

As observed in table [5], there are four megacities inefficient with severe level of inefficiency for all the investigated scenarios. The inefficiency levels exceed 80% in each individual scenario, more over these cities are the capitals for the corresponding countries which indicate that the other cities in the four countries are suffering more than the capitals. In addition, taking into consideration that the governments gave more construction for the service levels in the capital, so the unemployment rate expected to be hire in almost all the other cities in the four countries. Tehran (Iran) is the most inefficient

city comparing with the other three cities considering the inflation rate and the per capita which indicates that they didn't have enough support from the central government to solve those strategic issues. While Lagos (Nigeria) is

the lowest efficiency between the four counties considering the unemployment rate which indicate that the local government didn't offered practical solution to solve the unemployment problem.

Table 5: Category 3, Efficiency levels

City	Country	Efficiency Level of GDP per capita	Efficiency Level of Unemployment	Efficiency Level of Inflation	Efficiency Level of GDP per capita and Unemployment	Efficiency Level of GDP per capita and Inflation	Efficiency Level of Unemployment and Inflation	Efficiency Level of GDP per capita, Unemployment and Inflation
Rhine-Ruhr	Germany	3.40%	71.50%	90.70%	71.50%	90.70%	95.10%	95.10%
Tokyo	Japan	62.60%	45.10%	69.40%	71.30%	78.80%	69.40%	78.80%
London	Great Britain	6.70%	36.10%	69.30%	36.10%	69.30%	69.30%	69.30%
Moscow	Russia	84.10%	30.80%	26.10%	84.10%	84.10%	30.80%	84.10%
Shanghai	China	55.80%	28.60%	37.80%	55.80%	58.00%	37.80%	58.00%

Category 4: Inefficient Cities (6) with respect to any of the (7) assumed output scenario. The total inefficiency levels are less than 80% for each country.

As observed in table [6], there are four megacities inefficient with severe level of inefficiency for all the investigated scenarios. The inefficiency levels exceed 80% in each individual scenario, more over these cities are the

capitals for the corresponding countries which indicate that the other cities in the four countries are suffering more than the capitals. In addition, taking into consideration that the governments gave more construction for the service levels in the capital, so the unemployment rate expected to be hire in almost all the other cities in the four countries. Tehran (Iran) is the most inefficient city comparing with the other three cities considering the inflation rate and the per capita.

Table 6: Category 4, Efficiency levels

City	Country	Efficiency Level of GDP per capita	Efficiency Level of Unemployment	Efficiency Level of Inflation	Efficiency Level of GDP per capita and Unemployment	Efficiency Level of GDP per capita and Inflation	Efficiency Level of Unemployment and Inflation	Efficiency Level of GDP per capita, Unemployment and Inflation
New York	United States	18.40%	32.00%	48.90%	32.00%	48.90%	48.90%	48.90%
Mexico City	Mexico	11.70%	35.20%	28.80%	35.20%	28.80%	35.20%	35.20%
Jakarta	Indonesia	20.10%	25.30%	27%	25.30%	27.00%	27.00%	27.00%
São Paulo	Brazil	4.30%	9%	26.80%	9.00%	26.80%	26.80%	26.80%
Delhi	India	3.80%	11.60%	22.80%	11.60%	22.80%	22.80%	22.80%

Category 5: Inefficient Cities (4) with respect to any of the (7) assumed output scenario. The total inefficiency levels are at **least** 80% for each scenario.

As observed in table [7], there are four megacities inefficient with severe level of inefficiency for all the investigated scenarios. The inefficiency levels exceed 80% in each individual scenario, more over these cities are the capitals for the corresponding countries which indicate that the other cities in the four countries are suffering more than the capitals. In addition, taking into consideration that the governments gave more construction for the service levels in the capital, so the unemployment rate expected to be hire in almost all the other cities in the four countries. Tehran (Iran) is the most inefficient city comparing with the other three cities considering the inflation rate and the per capita which indicates that they didn't have enough support from the central government to solve those strategic issues. While Lagos (Nigeria) is the lowest efficiency between the four counties considering the unemployment rate which indicate that the local government didn't offer practical solution to solve the unemployment problem.

Table 7: Category 5, Efficiency levels

City	Country	Efficiency Level of GDP per capita	Efficiency Level of Unemployment	Efficiency Level of Inflation	Efficiency Level of GDP per capita and Unemployment	Efficiency Level of GDP per capita and Inflation	Efficiency Level of Unemployment and Inflation	Efficiency Level of GDP per capita, Unemployment and Inflation
Lagos	Nigeria	18.90%	6.60%	8.10%	18.90%	18.90%	8.10%	18.90%
Cairo	Egypt	18.60%	13.20%	9%	18.60%	18.60%	13.20%	18.60%
Tehran	Iran	4.80%	18.20%	4.70%	18.20%	5.10%	18.20%	18.20%
Istanbul	Turkey	15.60%	10.40%	8.40%	15.60%	15.60%	10.40%	15.60%

IV.   Conclusion:

By and large, the urban communities situated in high-salary countries are existence bumped available of the top rankings. Via 2030, just Tokyo-Yokohama and Seoul, in the middle of high salary domain urban communities, be situated probably going toward stay on the main ten. At this point, present plans show that Jakarta determination have developed the furthermost crowded. New York is probably going to decrease in rank. The entirety of that is predictable through UN plans, that show almost the entirety of the total populace development on upcoming eras drive to be outdoor the high salary domain.

Demographical Domain Municipal Zones was the primary to recognize the under approximation of populace on a portion of the world biggest municipal regions, thru different bases. Intended for instance, Demography's initial appraisals of the Jakarta, Delhi, Manila, Seoul-Incheon and Kuala Lumpur city region populaces remained distant greater than announced through others at that point. Different sources have modified their assessments upward. The prior, lower assessments of others were, in fact, metropolitan gauges that didn't adequately mull over the spread of urbanization past city or other topographical cutoff points. Demography's bigger populace gauges were the aftereffect of looking at genuine satellite maps to decide the degree of individual developed urban territories.

This work assessed the performance of 24 Megacities that have above ten million citizens in using the DEA methodology. Multi scenarios

according to the DEA output-oriented model to provide multiple choices to Decision Makers in these cities which can be more helpful in continuous improvement activities and achieve the best practice like the completely relatively efficient countries. The results of the DEA models showed efficiency average score approximately 60% for the main scenario.

The investigated Megacities were classified based on their obtained scores of efficiencies from the implementation of the DEA model and can be summarized in the following five categories:

Four efficient cities which are Bangkok, Bogota, Buenos Aires, and Lima with respect to all the assumed output scenarios, and their efficiency levels 100% for each proposed scenario.

Five partial efficient Cities which are Dhaka, Manila, Kinshasa, Seoul, and Paris are inefficient in at least one scenario, while all of them are efficient in the main scenario, their inefficiency levels between 13% and 97%. Dhaka is efficient in all scenario except if the GDP is considered it became inefficient. Seoul has the highest inefficiency score when the GDP per capita is considered. Manila succussed to recover the inefficiency of the inflation rates when it is merged with the unemployment rates, while the inefficiency reduced when the inflation merged with the GDP. Kinshasa succussed to recover the inefficiency of the unemployment rates when it is merged with the GDP per capita, while the inefficiency level didn't affect when the unemployment rates merged with the inflation rates.

Five partially inefficient Cities which are Rhine-Ruhr, Tokyo, London, Moscow, and Shanghai are inefficient in all the considered scenarios, with highest average inefficiency score 40% in the main scenario for Shanghai and lowest average score 5% for Rhine-Ruhr. All the

countries in this category have high inefficiency considering the unemployment rates as an output variable except Rhine-Ruhr which has the lowest inefficiency score when it come to the GDP per capita.

The remaining ten megacities New York, Mexico City, Karachi, Jakarta, São Paulo, Delhi, Lagos, Cairo, Tehran, and Istanbul are inefficient in all scenarios with sever inefficiency scores exceeds 60% in at least two scenarios. In addition, the last four megacities having inefficiency scores more than 80% in all scenarios.

V. Recommendations

- The answers for the issues and predicaments of creating world megacities are intricate. Be that as it may, a few methodologies are basic, for example, receiving "productivity" arrangements, concentrating on fitting training, creating credit and capital, empowering network interest, and concentrating on innovation.
- Approaches planned for utilizing all the more effectively the assets of the megacities and at growing progressively proficient frameworks incorporate the undeniable monetary control; the need to make money related changes and to encourage self-improvement exercises and crafted by business visionaries;
- Arrangements are additionally expected to safeguard the concurrence of new and more seasoned advancements to create joint endeavors with different urban communities to tackle basic issues that are past the capacities of a solitary megacity; and to decide the suitable adjusts among what should be possible at a family unit level and what can be worked at the city level.
- In creating world megacities, measures and particulars should support minimal effort

advances that require little upkeep and are anything but difficult to fix, rather than further developed, superior advances. Until that happens, automating the procedure might be in fact rich and stylishly satisfying, however could be socially destabilizing, regardless of whether it contradicts some common norms of a created world designing and social view.

- Involvement with creating nations shows that sponsorship of a whole help regularly prompts its crumbling as soon as it overloads urban spending plan and urban can't keep up the administration at a satisfactory level.

- "Sufficient" advances are required, that is, innovative arrangements that are satisfactory for the necessities of the megacities, however not all that sophisticated as to involve high designing, development, or working expenses.

- A megacity is another sort of marketplace which has fresh necessities, yet in addition, given its huge size, offers considerable chances to whomever, in either the creating or the created world, remembers it and has what it takes and persistence to seek after it.

- In due stage, approximately humble districts of a megacity expand financially and the storage compartment frameworks can be stretched out to them; yet new peripheral territories will emerge that over again will require adaptable frameworks.

- Worldwide Market Strategies: Systems that the creating scene megacities necessity to contemplate so as to energize these open doors incorporate making powerful interfaces among open and private divisions, giving hatcheries to fresh or nearby new fitting advances, and creating joint endeavors with different megacities to make a combined marketplace, beginning by a package of innovative work to help the innovation needs they share practically speaking

- Low work costs give creating world megacities a bit of leeway with regards to human concentrated administrations, for example, the travel industry, support, or even, conceivably, a few parts of medicinal services.

- The advancement of megacities in the creating scene will outline examples of nationwide and worldwide economies, will keep on influencing the payment of huge populaces, and will impact the social and political elements of the world.

References:

1. Banker, R., Charnes, A. and Cooper, W.W. (1984), "Some models for estimating technical and scale inefficiencies in data envelopment analysis", Management Science, Vol. 30 No. 9, pp. 1078-1092.

2. Banker, R.D., Charnes, A., Cooper, W.W., Swarts, W., Thomas, D., (1989), "An introduction to data envelopment analysis with some of its models and their uses", Research in Governmental and Nonprofit Accounting, Vol. 5 No. 1, pp. 125-163.

3. Bugliarello, G. 1994. Innovation and the city. Pp. 131-146 in Mega-city Growth and the Future, R. J. Fuchs, E. Brennan, J. Chamie, F. Lo, J. I. Uitto, eds. Tokyo: United Nations University Press.

4. Chen, Lu, et al. "Measurement report: Hygroscopic growth of ambient fine particles measured at five sites in China." Atmospheric Chemistry and Physics 22.10 (2022): 6773-6786.

5. Charnes, A., Cooper, W.W. and Rhodes, E. (1978), "Measuring the efficiency of decision-making units", European Journal of Operational Research, Vol. 2 No. 6, pp. 429-444.

6. Cooper, W.W., Seiford, L.M., Tone, K., (2007), "Data envelopment analysis: a comprehensive text with models,

applications, references and DEA-solver software", 2nd edition, Springer, New York.

7. Deng, Chenjuan, et al. "Formation and growth of sub-3 nm particles in megacities: impact of background aerosols." Faraday Discussions 226 (2021): 348-363.

8. Ding, Chengri, Xiao HE, and Yongming ZHU. "Megacity Growth, City System and Urban Strategy." Chinese Journal of Urban and Environmental Studies (2022): 2250005.

9. Emrouznejad, A., and Yang, G.L. (2018), "A survey and analysis of the first 40 years of scholarly literature in DEA: 1978-2016", Socio-Economic Planning Sciences, Vol. 61 No. 1, pp. 4-8.

10. Liu, Yue, et al. "Ecological security assessment for megacities in the Yangtze River basin: Applying improved emergy-ecological footprint and DEA-SBM model." Ecological Indicators 134 (2022): 108481.

11. Golany, B.A., Roll, Y., (1989), "An application procedure for data envelopment analysis", Omega, Vol. 17 No. 3, pp. 237-250.

12. Habib, A.M. and Shahwan, T.M. (2020), "Measuring the operational and financial efficiency using a Malmquist data envelopment analysis: a case of Egyptian hospitals", Benchmarking: An International Journal, Vol. 27 No. 9, pp. 2521-2536.

13. Index Mundi Homepage, https://www.indexmundi.com (Last accessed Sep, 2021).

14. International Monetary Fund Homepage, https://www.imf.org/external/index.htm (Last accessed Oct., 2021).

15. Mourad, N. and Tharwat, A. (2019), "Mixed Stochastic Input Oriented Data Envelopment Analysis Model", International Journal of Scientific & Technology Research, Vol. 8 No. 12, pp. 1839-1845.

16. Mapping the World's New Megacities in 2030 (Last accessed April, 2022).

https://www.visualcapitalist.com/mapping-the-worlds-new-megacities-in-2030/

17. Mourad, N. and Tharwat, A. (2020), "The Efficiency of a University's Colleges: A Case Study using Data Envelopment Analysis", Journal of Advanced Research in Dynamical and Control Systems, Vol. 12 No. 8-Special Issue, pp. 515-523.

18. Shahwan, T.M. and Habib, A.M. (2020), "Does the efficiency of corporate governance and intellectual capital affect a firm's financial distress? Evidence from Egypt", Journal of Intellectual Capital, Vol. 21 No. 3, pp. 403-430.

19. United Nations Human Settlements Program (UN-Habitat) (1996) The Habitat Agenda - Istanbul Declaration on Human Settlements, United Nations Conference on Human Settlements (Habitat II) in Istanbul, Turkey from 3 to 14 June 1996, http://www.unchs.org/unchs/english/hagenda/ist-dec.htm. (Last accessed April, 2022).

20. United Nations. 1998. Patterns in urbanization and the segments of urban development. In Proceedings of the Symposium on Internal Migration and Urbanization in Developing Countries, 22-24 January 1996.NewYork: United Nations Population Fund.

21. United Nations Development Program, Bureau for Crisis Prevention and Recovery (UNDP/BCPR) (2004): Reducing Disaster Risk. A Challenge for Development. A worldwide report, New York.

22. United Nations Human Settlements Program (UN-Habitat) (2004) The State of the World's Cities 2004/2005: Globalization and Urban Culture. London.

23. United Nations Office for the Coordination of Humanitarian Affairs (2005) Disaster Reduction and the Human Cost of Disaster

http://www.irinnews.org/ (Last accessed April, 2022).

24. United Nations Population Division (2006) World Urbanization Prospects: The 2005 Revision. New York

25. United Nations Population Fund (UNFPA) (2007) The State of the World Population 2007. New York.

26. Urbanization across the world today https://ourworldindata.org/urbanization#:~:text=Urban%20cluster%20%3A%20must%20have%20a%20minimum%20of,clusters%2C%20and%2015%25%20in%20rural%20areas%20in%202015. (Last accessed May, 2022).

27. World Bank. 1995. Better Urban Services: Finding the Right Incentives. Washington, D.C.: World Bank.

28. World Health Organization Homepage, https://www.who.int (Last accessed Oct., 2021).

29. World Resources Institute. 1996. World Resources, 1996-97. New York: Oxford University Press.

30. Worldometers Homepage, https://www.worldometers.info (Last accessed Oct., 2021).

31. Xia, Chang, and Bin Zhang. "Exploring the effects of partitioned transition rules upon urban growth simulation in a megacity region: A comparative study of cellular automata-based models in the Greater Wuhan Area." GIScience & Remote Sensing 58.5 (2021): 693-716.

32. Zheng, Qiming, Qihao Weng, and Ke Wang. "Characterizing urban land changes of 30 global megacities using nighttime light time series stacks." ISPRS Journal of Photogrammetry and Remote Sensing 173 (2021): 10-23.