Environmental Footmark and Its Effects on the Sustainability of Towns

Lect. Dr. Ali Abdul Samea Hameed
Governmental Contracts Division - University of Baghdad, Baghdad / Iraq
ali84_baghdad@uobaghdad.edu.iq

البصمة البيئية
وأثرها على استدامة المدن

م. د. علي عبد السميع حميد
رئاسة جامعة بغداد – شعبة العقود الحكومية، بغداد \ العراق

Abstract

TheEcological Footmark (EF) is one of the utmost recent and important criteria for assessing the capacity of the population to uphold a life sustainable way. It tests the extent which the indicators have an influence on the natural resources (NR) of the ecosystem such as forestry, water bodies, agricultural lands, pastures, CO2, and properties for construction purposes. This footmark was utilized to evaluate the use of NR to the capacity of the land for regeneration. This research paper discusses the theoretical conceptual component of the EF framework and plans regarding issues related to the environment. The environmental image (EI) crystallizing process is also highlighted in this study. The scientific assessment of the environmental footmark (EFM) of the Najaf Governorate (NG) serves as a representation of the practical aspect.

The application of the research led to the finding that each person in the NG had an environmental impact of 1.58 hs. Such value of application to the Najaf perception in 2006 and the current situation in 2019 is the following step. The main plan for Najaf city has been evaluated for its potential effects on the environment up to 2030. The goal is to lessen Najaf's environmental imprint in the following years and to enhance its environmental reputation in addition to researching potential future situations.

Keywords: Environment, Footmark, Effect and Sustainable .

المستخلص

البصمة البيئية (EF) هي واحدة من أحدث وأهم المعايير لتقييم قدرة السكان على الحفاظ على نمط حياة مستدام. تقيم إلى أي حد لديها المؤشرات تأثيرًا على الموارد الطبيعية (NR) للنظام البيئي مثل الغابات، وأجسام المياه، والأراضي الزراعية، والمراعي، وثاني أكسيد الكربون، والممتلكات لأغراض البناء.

تم استخدام هذه البصمة لتقييم استخدام الموارد الطبيعية لسعة الأرض للتجديد. يناقش هذا البحث الجزء النظري التصوري لإطار البصمة البيئية والخطط المتعلقة بقضايا البيئة. يتم تسليط الضوء أيضًا على عملية تجسيد الصورة البيئية في هذه الدراسة. يعتبر التقييم العلمي للبصمة البيئية (EFM) لمحافظة النجف (NG) تمثيلاً للجانب العملي.

أدت تطبيقات البحث إلى اكتشاف أن لدى كل فرد في NG تأثيرًا بيئيًا بحجم 1.58 هكتار. يعتبر هذا القيمة تطبيقًا لتصور النجف في عام 2006 والوضع الحالي في عام 2019 خطوة تالية.

تم تقييم الخطة الرئيسية لمدينة النجف لتأثيراتها المحتملة على البيئة حتى عام 2030. الهدف هو تقليل البصمة البيئية للنجف في السنوات القادمة وتعزيز سمعتها البيئية بالإضافة إلى البحث في المواقف المستقبلية المحتملة.

الكلمات المفتاحية : البيئة ، البصمة ، التأثير ، الإستدامة .

1. Introduction

The (EF) is an accounting as a biomass-based approach designed for tracking human demand for fundamental services of nature and their availability as a critical service for the environment (Petric, 2004). The main goal of such accounting approach is to provide a standard for evaluating the strain that humans place on the environment and their applicability to a range of goods globally (Xie, *et al.*, 2014).

Basically, it enables consumers to comprehend the regional resource market and investigate how it affects the worldwide sustainability issue. Finding a style of living that works for everyone while preserving the resources of the world is what is meant by sustainability (Wang, *et al.*, 2007).

When it comes to urban environments, it is essential to create a healthful relationship between towns and the planet (Santoso & Aulia, 2018). Although all towns have been prospering so far, they have been deteriorating the survival climate too. This is only feasible because of the historical EF expansion, the surrounding area where towns produce the energy and gather the contaminants and garbage of their own (Syrovátka, 2020).

Since the NR is limited, there is a need to expand the environmental development consideration through speeches on environmental preservation and cover the entire field which is presently around areas being urban (Fiala, 2008).

With the current climate warming, the concept of EF becomes increasingly crucial. By explaining the components in a transparent and ecologically sound manner, sustainability able to be achieved (Yao, *et al.*, 2016). Having that said, politicians will be able to assess a community's environmental impact using EF information and compare it to the environment's capacity to recover (Scotti , *et al.*, 2009) .

With the help of these studies we able to work on ecological effectiveness, identify the impediments to ecological load decline and see the progress attained in sustainable approaches (Scotti, *et al.*, 2009). Therefore, the EF is able to be utilized to assess the practicality of theoretically useful proposals and lead to creating applicable methods and scenarios (Siche, *et al.*, 2008).

Due to a variety of factors, such as the world's rapid population growth, we are currently experiencing several environmental repercussions in metropolitan areas (Hopton & Berland, 2015)., as reported by the United Nations Population Division, 54% of the population of the world resided in areas being urban in 2016. By 2020, Ministry of Planning projects that there will be 40 million people living in Iraq (Ding & Peng, 2018).

According to the survey, 30% of Iraq's people live in rural areas, compared to 70% in metropolitan areas (Lee & Peng, 2014). Because of this, towns produce several indications of natural resource high levels use, and decisions made by urban should be ready to deal with and detect such repercussions of the environment (Wiedmann & Barrett, 2010).

2. Barriers

The failure to embrace indicators of the environment (such as the EF) throughout the urban growth procedure of towns resulting in a loss in the offered urban services functional effectiveness and, as a result, distorts the city's environmental reputation.

3. What does this research focus on?

This study targets the following goals:

A. Developing a methodology to measure the EFM in towns, the Najaf city in particular.

B. Increasing the quality of modern life by the use of the EFM.

C. Suggesting feasible and cutting-edge approaches for enhancing the environment and the well-being of life in Najaf, with the help of one of the environmental planning techniques as a result of the abilities offered for producing the environmental town's image in Iraq.

4. Background

The purpose of employing the EFM, its elements, and the ways where the EFM able to be computed will all be covered in this part, which will also introduce the concept's key dimensions.

4.1 EF Definition

The EF is an indication of the how a specific people affect the earth and its systems as typical (Ismael, *et al.*, 2019). It demonstrates the point to which a nation's population's lifestyle is sustainable as well as the severity of its effects and harm to the environment (Wood & Garnett, 2009). The EF is a technique mathematically unique as it able to calculate the effects of humans on the ecosystem at whichever magnitude (Santoso & Aulia, 2018).

Fingerprints are able to be measured for people, firms, towns and states, and then compare the findings across these metrics and places (Ding & Peng, 2018). The EF able to also be utilized as a tool for assisting local makers of decision on regional or local planning approaches that is additionally noteworthy compared to that only making instructive comparisons (Fiala, 2008).

4.2 EF components

A comprehensive EF Index key elements informationbase, as it comes in the following part, should be available for calculating the EF (Hopton & Berland, 2015).

- Land of energy: Woodland would be needed for removing CO2 emissions from energy of every person usage.
- Harvest land: the farmland required to grow the food that is consumed.
- Land of pasture: the area requisite for producing essential products for animals.
- Woodland: the area of forest requisite for producing paper and wood.
- Sea area: the sea area utilized for the production seafood.
- Built area: the area utilized as housing accommodation and infrastructure

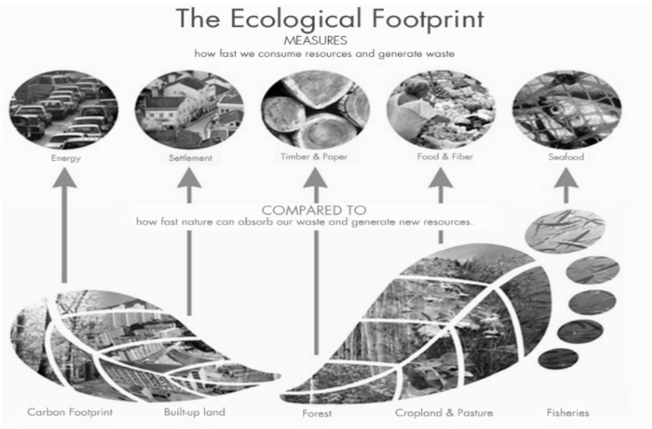

Figure 1: the EF component

Therefore, The EF basically determines supply and demand. It also determines the assets of ecology (assimilation biological volume or biologically fertile seas and land) which is essential for individuals to make services and the NR they rely on basis as regular, like vegetables, livestock, marine animals and wood) (Hoekstra, 2009).

The genetic footmark assesses the impact of trash in addition to the regions allotted for infrastructure (CO_2 as a result from the process of incineration). Biological absorption capacity is utilised in the display process to keep track of the ecological resources that are available both locally and globally (Kratena, 2008).

4.3 The EF function

The EF able to also contribute to resources conservation and waste management as it able to be utilized to assess towns by comparing the ecological provided services with the demand intensity on the earth (Wackernagel, 2009). It as well aims to persuade officials and the public as general for incorporating accounting of environmente into their routine work so that the area able to continue to have a healthy, sustainable environment and a competitive, viable economy for a very long period (Solarin, *et al.*, 2019).

The EF is a global strategy which aims to keep the environmental resources that are accessible to people from excessive use, and it has the capacity to turn sustainability from an imprecise idea into a quantifiable goal. Applying these ideas is what EF aims to do to make towns environmentally sustainable. (Lustigová & Kušková, 2012).

5. How to estimate the EF?

The calculating methods of EF are Component method, Compound method, and direct method. They basically vary according to diverse information sources. Few towns in the EF research benefit from the mixture technique that mixes elements from few or all of the three methods (Wang, *et al.*, 2013)

- **Component method**: The Components Method, which uses a bottom-up methodology, is the best way to assess a city's or region's EF. It also covers any actions that are carried out in close proximity to and contact with the populace. Rather of adopting the economic model's commodity dynamics (Albarracin, 2017). Because of the connection between citizens' consumption behaviours and the availability of citywide consumption information, it is signifiable tot to note that the element technique is utilized in many towns. Depending on the circumstances in each city, each consumption component is described in greater detail. Numerous studies have employed particular sets of consuming components to simplify various products for calculation reasons (Zakari, *et al.*, 2012).
- **Compound method**: This method comes after the approach of Wackernagel and Rees, in which information is utilized for all produced commodities or exchanged. For instance, we gather information on the pine wood amount in USA, if it is imported or exported, and after that compute it's EF. The same is true for whole other goods (Jiao, *et al.*, 2013). The footmark able to be predicted

according to the national footmark utilizing the proportion between the locally set information and the similar nationally set information. This approach does not rely heavily on local information collecting, making it one of the easiest approaches for determining towns' EFMs. The following equation explains the combined approach for estimating the EFM as the ultimate footmark is generated from the estimate of the national footmark. (Vačkář, 2012).

- **Direct Method**: This approach is frequently utilized to estimate a company's, a household's, or an individual's EFM. The strategy makes use of information gathered from various consumer activity groups, and direct information collecting is not always possible. Therefore, it is unknown whether the direct method is employed to calculate towns' EFMs. However, a research firm in the UK known for its environmental effects and specialising in the measuring of the EF exists (Teixidó-Figueras & Duro, 2014).

6. Najaf city EF

NG is responsible in extracting the EF value as the essential information is available. The investigator made the use of few general indicators for boundaries explanation. The study information includes: The present NG administrative division comprises 3 districts: Al Manathira, Kufa and Najaf district centre. It also comprises of 9 sub-districts: Shabaka, Al-Haidariyah, Al-Qadisiyah, Al-Abbasiya, Al-Hurriya, Al-Mashkhab. In the following some information information about the city .

- area of Najaf province: 2882419 hs
- The study area: 6584 hs

- NG population: 1462708 inhabitants
- The population of study area: 781386
- The population as urban: 71%
- The rural population: 29%

6.1 The EF in the Najaf holy city

At the current part, the whole governorate of Najaf area and the whole population of governerate is utilized to extract as indicators quantitative for obtaining the governorate's EFM. After applying these indicators scientifically, a proposal will be drawn up for the Najaf city fundamental plans to crystallise the EI for every city.

Elements of the EFM are exemplified in terms of farming land, rural land, H2O footmark, waste production footmark, C footmark, alternative footmark of energy, and built-up area.

6.1.1 The crop land analysis

The three main agricultural crops (rice, wheat, and barley) are widely grown in the province of Najaf, with annual production numbers measured in tonnes. The community of Najaf will determine the ecological agricultural yields impact according to knowledge of consumption.

The EF able to be measured with information as follow:

- Agricultural crop production: 22982898 tons
- Agricultural grains production exploited area: 98386.9 h
- Daily consumption rate per capita from the food group = 1989g / person / day, annually = 736589 g / person / year, i.e. 0.683726 tons per person in a year.

The utilized equation for that is as follows:

- Average h = cereal crops production quantity / total governorate area = 22992898/2882419 =7.9

The following step is calculating the farming land footmark which is according to the proportion and ratio method, and such is done according to the following method:

- 2882422 hs (governorate area) * 22992898 tons (crop production) 7.896945059* X tons (consumption per capita per year) 0.08997 h= 0.0876
- Then such result multiplied by the population number in the city which is 1482708 = 139287,56
- The farming land footmark = 5,9%

6.1.2 Foraging land

Extensive pasture lands are there in the Badia, Najaf that had received no care, nonetheless are managed by the Nomads population of an area of 66,266 hs.

The EF is measured by the equation as follow: Average h = pastoral area / decertified land area

= 66266/3320= 16, 99.

Pastoral Land footmark =0.002%

6.1.3 The area of water space

The study will focus on the surface water of 18163075 hs needed to produce fish for human consumption in (Shatt al-Kufa and Bahr al-Najaf), mentioning that the daily consumption of water is 350 litters.

The following equation able to calculate the EF:

- the amount of daily water use and all uses x the total population of the study area x 365 days X 350 L X 1,462,726 Population =19686069169.
- For every million litters, 0.08 hs of space is needed 19686069169 /1000000 = 186860,9
- 186860,9 x 0.08=149480856 hs county EF for individuals = 149480856/14627.8 = 0.12
- Water footmark =0,732 %

6.1.4 Waste footmark produced

The daily waste production is 1 kg. Every 1 cubic meters of waste equals 450 kg. To obtain the waste fingerprint, we need the dependence on levels of consumption, annual waste production, and then it able to be measured in worldwide scale. The waste Footmark able to be measured as follow:

The daily waste amount production (kg per capita) × the total study area population = 1x365x1462709= 533887690 kg

Waste Footmark measured according to each cubic meter:

533887690/ 450= 1186417

every one h is equal to 100000 cubic meters. So:

the governorate of Najaf waste Footmark: 1186417/ 100000= 11869

Waste Footmark for individuals: 11869/1462709= 0.0000832

Waste footmark =0,007%

6.1.5 Energy Land footmark

The land measurement required for absorbing CO2 emissions is the energy footmark (EF). Such strategy focuses on the energy use effects, specifically CO_2, to draw attention to the issue and open the door for remedial action. Environmental problems such heavy urbanisation, agricultural activities, changes in land usage, or global or local farming practises have drastically reduced the ability of soil to absorb CO_2 in several locations.

In 1999, the whole volume of the EF was about 6, 72 billion hs. The field comprises of 11, 4 billion hs (including land employed, plus future crops). The whole EFM was 13, 65 billion hs.

Along with the use of environmentally friendly technologies like solar and wind, increased growth of plant (sequestration) is one primary way that the EF is expanding. Similar to the oil footmark, the EF is a degree of change which is applied to organize collective intervention. This term has been quickly grasped by developing the meaning to the individual's perspective. Additionally, it supports collaboration and coalitions between various stakeholders in an effort to find novel, workable, and less trouble few solutions.

Total load for power in NG = (3555616) MB = 35555616000 Kilowatt hours.

To convert the electrical load into area (hs), it must be multiplied by conversion constant (0.000174), so 35555616000 × 0.000174 = 618679.286 hs (governorate).

The EF per capita footmark = 618679.286/ 1462706 = 0.42 hs per capita.

Energy power footmark =28.9%

6.1.6 C footmark (CF)

A CF is a measurement of the amount of greenhouse gases, primarily CO_2 that one human action releases into the environment. A person, a family, an event, an institution, or even an entire behaviour of nation able to all is included in a CF measurement.

It is common to estimate the annual tonnes of CO2 produced which able to be paired with tonnes of emissions from other fossil gases like nitrous oxide and methane. When calculating a CF, many factors are considered. For instance, transporting gasoline to a store uses up a lot of fossil fuels and emits greenhouse gases. Such store is powered by electricity and probably has its own C emissions. Likewise, the commodities in the shop have all been carried there so it is necessary to consider the whole C emissions.

Additionally, all of the berries, veggies, and meats that the store sells are grown and processed on farms using a procedure that releases 25 times as much CO2 greenhouse gas. Both of these elements must be included in order to fully account for the CF of a certain activity.

The consumption of gasoline: 900000 L

Population served number = population of governorate / household average number.

Number of populations served = 2882496/5 = 292539.

The average car ownership is one car per a family.

A family's daily ration: 900000/292541 = 3.48 liters per day

the family's annual share of gasoline: 3.48 liters x 365 days = 1120,65 liters/ year.

For extraction a C emissions h from the index annual consumption of gasoline, we need few constants:

The utilized constant in the conversion for obtaining the C CO2 quantities is BILLION BTU/TONES CARBP= 19.35.

The constant to be utilized as a standard unit when heating 1 gallon is BTU/gallon= 125000

4.5 liters = 1 gallon, so from litter o gallon 1120, 56/4.5= 249. From gallon to BTU as follows:

249 gallons *125000 (BTU/GALLON) = 31125000 BTU =0.031125 billion BTU.

0031125*billion BTU* (billion BTU/tubes C=19.35) = 0.698 tons C.

1 tons = 1.8 hs thus: (0.698/1.8) =0.34 (City footmark)

City footmark = 0.33 hs * 292541 households =96538.89 hs footmark for each family.

6.1.7 Gasoline footmark

The average daily Gasoline consumption is 100 m3 =100 thousand L

Population served number = Population of governorate / household number as average: 2882400/5 = 292541 households.

Average car ownership is one car per a family. When the family daily share is 100000/292541 = 0.34 L/ day.

Annual gasoline share for every family = 0.34 L x 365 days = 124 L per a year.

For extraction a C emissions h from the annual consumption index gasoline, we will depend on few constants as following:

(Billion BTU/ tons of C) = 19.35, it is the constant utilized in conversion for obtaining the CO2 quantities.

(BTU/gallon) =138700, it is stable and is considered a unit of heat utilized to heat 1 gallon

124 / 4.5 = 27.5 gallon

The converting from gallon to BTU is 27.5 gallon*(BTU/gallon) 138700= 3814250= 0.0038 billion BTU.

Area (hs) of emissions = (billion BTU/tones C) *19.95*0.0038 billion BTU= 0.075-ton C.

1 ton =1.8 hs and thus 0.075/1.8=0.041 footmark per a family Therefore, the footmark of the city:

0.041 h *292541 family = 11994.18 h

6.1.8 Oil footmark

The family's annual share of oil = 100 L/year.

The constants needed are as follows:

(Billion BTU/ tons of C) = 19.35

(BTU/gallon) =138700

The conversion from liter to gallon is = 200 / 4.5 = 44.4 gallon

The converting from gallon to BTU is 44.4 gallon*(BTU/gallon) 138700= 6158280, that is = 0.0061 billion BTU.

Thus, Area (hs) of emissions = (billion BTU/tones C) *19.95*0.0061 billion BTU= 1.21-ton C.

1 ton = 1.8 hs and thus 1.21/1.8=0.67 footmark for each family. Therefore, the footmark of the city:

0.67 h *292541 family = 196002.47 h

The final CF is equal to = gasoline footmark + fuel footmark + oil footmark

= 96538.53+11994.18+196002.47 = 304535.18 5 hs.

Whole CF =15.9%

6.2 Area as built-up

The footmark of the area as built-up in a city comprises the space occupied by businesses, buildings, and industrial facilities. Built-up area In NG is 20031.25 H/s. Individual footmark of average h = area as built up/ Governorate land area = 20031.25/2882400= 0.69 the individual footmark.

Thus, the city footmark f = 0.69*1462706=1009267.14 Considering the EFM indicators, the total EF = 2080 951.064 h/s. Dividing such by the total governorate population (2882400), we gain the EF of Najaf city which is mentioned in Table (1) below:

Built-up footmark =479%

Table (1), The EF of NG in 2019

Element	Area (Hs)	Percentage %
Farming footmark	142584.62	5.9
Footmark as pastoral land	18.99	0.002
H2O footmark	158576347	0,732
Footmark as waste	120,59	0,007
Footmark as power of energy	656,968.176	28.9
CF	336385. 22	15.9
Built-up footmark	1239268,12	47.9
Print set	2163854.125	100
The footmark of individual in province of Najaf	1,58 (per Person)	_

According to the conclusion, the value of the extracted EF for NG is 1.58 hs, as it is 1.82 hs for Iraq. It indicates that this percentage will increase over the future years and beyond the permitted international limit. "The built-up area" accounts for 47.9% of NG's EF, making it one of the most significant tot factors. It denotes the land resource overuse in terms of the fundamental design city's excesses and the disadvantages of its regular and uniform distribution of land use. The EFM increases by 28.9% after the (energy) footmark, which is what comes following. There are various causes for this, including the absolute reliance on one energy source for everyday needs and the absence of an electric energy consumer culture.

The CF, which accounts for 15.9% of the high environmental impact, is the final important factor. Because of the heavy reliance on fossil fuels, companies, residences, and car exhaust all contribute to the emission of emissions of C and gases to the surrounding atmosphere, which results in a wide range of environmental and health issues for both individuals and towns. The mostly detrimental fingerprints in the Najaf province are the footmark built-area, EF, and CF. They cause the city's environmental reputation to be distorted, whilst the other footmark had a smaller influence but produced numerous, unresolved issues. Such issues must be dealt with through sustainable environmental management on both a short-term and long-term basis.

7. Fundamental plans for the Najaf city

At the current section, the Najaf city EF amount (1.58) will be utilized and applied to all land utilizes in the city for 10 years (2009-2019) to analyse the environmental city picture and indicate the -ve and +ve the city’s image effects over that period.

The main plan outlines how the city will develop and evolve throughout time. The fundamental plan relies on the spatial and temporal dimensions, and it establishes how the land is utilized and distributed in space. There are few basic plans considered for the Najaf city:

- In 1958 AD, the first main plan has been made through a Greek company of planning named Doxiades.
- The plan was set up by the Commission of Urban Planning in Planning Ministry, following the creation of the NG, and making the city the centre of administration, was suggested for extending the city until 2000.

- Lewin Dever (British company), in architectural design office cooperation with the engineering consultancy, has also prepared a plan for 2030.

It will discuss 3 city EIs that are from 2009 and 2019 and the future image for 2030, after identifying the fundamental plans created for the Najaf city. We apply the amount of the EFM to the amount of usage for every period to reach a deeper understanding of environmental picture and its impacts.

In 2009, the Najaf city population is 521864 (Central Bureau of Statistics). The area city is 5891 h, whereas the density of population is 455.2 people / h.

Table (2) below displays the land use areas in h within the city in 2009.

Table (2), The relative land use area distribution in the Najaf city in 2009

Type of area	Plan 1	Percentage for each use	Fingerprint per use
Housing	1856.72	41.00	52.86
Commercial	42.64	1.82	1.22
Green areas	329.59	5.81	8.97
Educational	239.64	5.32	6.56
Health	23.89	0.62	1.23
Religious	6.41	0.29	0.49
Industrial	141.20	2.99	3.99
Public services	465.31	8.99	12.95
Special uses	1056.23	21.63	31.84

The Najaf EF value is 1.58. By applying the land use percentage, the EFM of the city's master plan will be attained in 2009. Considering such, the EI will be analysed and the positive and negative influences will be assessed.

Statistical estimation mention that the Najaf city population as 7, 71279 in 2019 (Information published by the Central Statistics Bureau, 2019). Table (3) shows area of land use in Hs:

Table (3), The relative distribution of the area of land use in the Najaf city in 2019

Type of area	Existing value	Ratio value for each use	Footmark for each use
Residential	2012.12	31.98	44.19
Commercial	342.71	4.98	7.65
Green areas	543.69	8.84	12.46
Educational	259.64	4.101	4.98.32
Health	31.95	0.69	0.86
Religious	16.32	0.53	0.42
Industry	132.23	1.89	2.99
Roads	1269.12	19.89	27.85
Services	385.32	5.89	7.89.22
Special use	1689.79	26.96	37.49

The main plan for the Holy Najaf city was made by the Lewin Diver (British company) in cooperation with the Engineering Consultants of Architectural Design Office for 2008-2023. Although the design was finished in the last 9 years, a big part of it has not been implemented due to many reasons. The estimated proposed land usage percentages for the Najaf city for the year 2030 are mentioned in the following Table (4):

Table (4), The relative land area use distribution in the Najaf city for 2030

Land type	Plan for 2030	Ratio value for each use	Footmark for every utilize use
Residential	4743.23	27.46	41.36
Commercial	678.36	4.89	6.32
Green areas	2784.36	17.12	22.89
Educational	259.76	1.83	3.01
Health	31.95	0.69	0.86
Religious	164.13	1.01	1.26
Industry	1628.11	8.99	12.98
Roads	2469.12	16.01	23.09
Services	1241.23	6.88	11.06
Special use	2589.26	14.97	22.36

Following the process of displaying all of the city's land use proportions during three phases and the EF generated by each of them, a comparing between the land use proportions will be made to understand changes in the environmental city reputation.

What were the causes of these changes, which in turn produced several urban and environmental issues that altered Najaf's perception of its environment?

Following making a compare between 3 elementary charts, in 2009, 2019, and 2023, significant tot points were observed.

These designs have the potential to significant totly alter residential, commercial, and green space use. Additionally, it was discovered that there are no locations specifically for house shopping and that commercial utilize of tape and large-scale utilize overlap in whole residential neighbourhoods and the areas around every neighbourhood. Additionally, it appears that few green spaces don't meet the needs for planting design, while others are soil spaces utilized for other things like playgrounds for kids or generator yards.

By 2030, the implementation of the future master plan, which was created in 2010, will have been complete. However, we discovered a signifiable tot number of violations in the land use plan in 2019—nine years after the intended plan was put into effect. In the Al-Barakya neighbourhood and in the vicinity of the Najaf International Airport, for instance, agricultural areas have been transformed into residential plots.

We also observe that, except for one section that was located directly in the southern part of the city, close to the current Najaf International Airport, further development has not been considered. They have also repeatedly failed for including the industrial zone in the plan's periphery.

The transportation issue was not addressed in the future master plan, and conventional approaches to road planning and design continued to resemble the existing old domestic neighbourhood's hierarchy. Besides, the absence of a sustainable design for the street basin, they neglected to account for the rise in the number of cars in the neighbourhood. The plan takes all of this into consideration.

8. Conclusion

Most government organisations employ the planning process, along with recurring reports and research, to address strategic issues. In the discipline of planning, whether urban, environmental, or regional, there is specialisation environmental dimension and a vision dearth. Utilizing contemporary technology to acquire descriptive, digital, and particularly geographical data (geographic data systems) that aids in improving the environmental issues monitoring and performance is one of the instruments for environmental planning.

Besides, the numerous components existence utilized in the EFM calculation i.e., C, agricultural land, pastures, forests, etc., there are numerous methods to gain the EFM for each stage (individual, city, or region).

The EFM analysis, which is entirely distinct from the environmental influence evaluation now utilised in the environmental evaluation of strategies, is involved with the identifying process of the human activities environmental effects on NR. A variety of other planning issues exist in the city of Iraq as a whole, including environmental degradation, resource decline, desertification, climate change, and other urban issues. These factors—the agricultural sector, urbanisation, rapid population expansion, and migration—all skew the city's EI.

Built-up area, EF, and CF are the mostly noteworthy factors which increase the EF because of our NR excessive use. The EF of the NG, measured using the operational framework, is 1,58 hs per person, which implies that there has been a significant tot loss of NR that has outpaced the land's biological carrying capacity. The presence of the highest EFs was observed in the research year, 2019, and it was evident from the land use scheme that there are numerous planning issues. This was accomplished through applying the extracted EF value to the image of the Najaf city within 3 timeframes, 2009, 2019, and 2030.

9. Suggestions

Considering the statistics included in this study, the researcher suggests few points as follows:

1. Rethinking the 2030 main plan for Najaf since it doesn't address the city's present issues.
2. Re-evaluating the legal authority for carrying out plans for urban development in the city that have an environmental component.
3. To solve the city's environmental and urban concerns, government institutions must implement the future possibilities that have been proposed throughout the research.
4. It is essential to use a collaborative method (group) when creating urban improvement plans, and then to offer them to academic institutes for feedback on the developed solutions.
5. It is good to encourage civil society organisations to host meetings or make use of social media to gather people's issues and viewpoints in order to gain from them. These groups, on the other hand, are built around promoting consumer culture toward NR.

6. The city should increase its capacity to stabilize its EF, as well as the population's purchasing habits and lifestyle, to lessen its environmental impact. All news reporters should have access to the EF results. The work of significant tot methods in the estimating process of EFM, making the city sustainable, should be covered in an introduction guide.
7. Reducing foreign imports and promoting domestic goods financially and in the media will boost farming and industrial production, create more jobs, protect fertile land, and stop it from being put to use in a manner that is incompatible with other nearby uses.
8. Reducing reliance on fossil-fuel private automobiles and the C emissions they produce that are bad for the city's environment and people's health will be made possible by using public transportation, separating pedestrians from autos, and building rail and subway infrastructure.
9. Increase the clean energy use using wind power, the sun, and the ground. The roof of the buildings able to be utilized to put solar panels, the desert lands in the city able to be utilized to construct high wind turbines, and the exploitation of the heat of the ground. It should be considered that the Najaf city is hot and dry most of the year and this contribute to the use of technologies to extract energy stored in the ground. All these trends will reduce the process of electricity consumption and therefore preserve NR.
10. Modern approaches able to eliminate many environmental and urban problems.

11. Making deals with the property ownership in the city, as it causes environmental problems, able to be considered to be one of the thresholds for urban development in the city. It is essential to take the public interest into account, Above all, in the creation of towns appropriate for maintainable living, and to move towards mixed utilize at the buildings level.

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