

EVALUATING THE IMPACT OF URBAN SPRAWL ON PERIPHERAL AGRICULTURE FIELDS AND WATER BODIES OF MYSORE CITY

Manjunatha, C.S.¹ and Chandrashekhara, B.²

¹Department of Studies in Geography, Karnataka State Open University, Mukthagangothri, Mysuru-570006, India.

²Department of Studies in Geography, University of Mysore, Manasagangothri, Mysuru-570006, India.

DOI: 10.46609/IJSSER.2021.v06i10.043 URL: <https://doi.org/10.46609/IJSSER.2021.v06i10.043>

ABSTRACT

Scattered urbanisation at the periphery of the cities is known as sprawl. Rapid urbanisation especially in the form of sprawl causes conversion of agricultural fields into urban area and encroach water bodies leading to dry-up and pollution that are later converted into parks or play grounds. The aim of this paper is to evaluate the impact of urban sprawl on peripheral agriculture fields and water bodies of the Mysore city which is blessed with several tanks and lakes viz., Kukkarahalli lake, Karanji lake, Dalvoy lake, Lingambudikere, Devnoor lake etc. The study adopted the “questionnaire survey method” wherein a set of questions is served to randomly selected people from adjacent villages of Mysore local planning area. The questionnaire is prepared in such a way that seeks the perception of villagers regarding impact of scattered urbanisation on the peripheral agriculture fields and water bodies of the Mysore city. The study reveals that fertile agriculture fields of adjacent villages of Mysore city now converted as layouts or land left vacant to be used for development of layouts in future. Majority of responds agreed that lakes and feeder channels of those lakes are being encroached due to urban growth with more intensive towards north direction of the city. The “smart growth” should be promoted to resolve the problems posed by urban sprawl. To save lakes, private companies should be allowed to maintain, encouraging fishery, creating botanical gardens and recreation facilities etc. The concern local authorities should take actions to stop releasing sewage and dumping debris into lakes.

Keywords: Urban sprawl, Questionnaire survey method, agriculture fields, mixed land use, water bodies, community.

1. Introduction

Urban Sprawl is one of the issues associated with rapid urbanization. Sprawl is a multi-dimensional phenomenon that could be a process of development or a stage in a development process and not a static condition. "Low-density development beyond the edge of service and employment, which separates where people live from where they work and therefore requiring cars" (Sierra Club, 1998). Sprawl is a low-density development along the outer fringes of city (Torrens and Alberti, 2000; Angel et al., 2007; Darío, 2014). Scattered urbanisation at the periphery of the cities is common now. Sprawl is also characterized as homogeneous land-use which promotes regional and local unsustainability. People of sprawl region inevitably depend upon their own vehicle to commute for daily routine life right from going for work, shopping, schools etc. which will generate cascading effects on livelihood and environment (Glaeser and Kahn, 2003; Ojima, and Hogan, 2009).

Rapid urbanisation especially in the form of sprawl causes massive land-use land cover change with conversion of agricultural fields into urban area (Burchell et al., 1998; Shalaby et al., 2012; Singh, 2014). Sprawling results in creation of small land holdings, speculation of real estate boom etc. force the farmers to keep the land vacant to get advantage of boom may arise in the coming days.

Water bodies play a vital role in an urban center by supplying water for drinking, agriculture, collecting excessive rainfall, recreational spot, offering pleasant weather, conducive for groundwater recharge etc. However, rapid and haphazard urbanization encroach water bodies leading to dry-up and pollution that are later converted into parks or play grounds. The loss of water bodies is a critical factor in the lowering of water table resulting in water crisis. Interconnecting or feeder channels of the lakes are the main source of water through which water from catchment areas flows in to lakes. Unplanned urban growth resulting in filling up of interconnecting water channels which ended in dry-up of wetlands. Vanished interconnectivity of lakes is also resulting in fail to hold water during heavy rains and providing water supply at the times of water shortage and droughts (Ramachandraiah and Sheela Prasad, 2004; Kuchay and Bhat, 2014).

2. Objective

To evaluating the impact of urban sprawl on peripheral agriculture fields and water bodies of the Mysore city.

3. Study Area

The study area of the present research work is Local Planning District of Mysore city which spreads over an area of 507.72 sqkm. It lies between 12° 14' 41" to 12° 22' 25" N latitudes and 76° 34' 20" to 76° 43' 23" E longitudes. The Mysore district shares boundary with Tamil Nadu state to its southeast, the Kodagu district to its west, Mandya district to its north, Hassan district to its northwest and Bangalore district to its northeast. The northern part of the city is drained by river Cauvery and the south is drained by the river Kabini. The Mysore city blessed with several tanks and lakes viz., Kukkarahalli lake, Karanji lake, Dalvoy lake, Lingambudikere, Devnoor lake etc. These lakes provide water supply for drinking, irrigation, industries and other associated works. The intake supply for those lakes was largely rainwater. These lakes immensely contribute to improve groundwater table in the Mysore region.

The total area under MUDA limit was 7,142.93 hectares in 2001 which has increased to 14,034.67 hectares by 2011. The residential area was 39.9% in 2001 which rose to 43.45 in 2011; commercial land use was 3.02% in 2001 which decreased to 2.45% whereas industrial land use remains almost same. Despite of MUDA limits increase, water body's cover has declined from 2.02% to 1.27% during 2001 to 2011. Agriculture land use has increased from 2.27% to 6.41% due to inclusion of neighboring villages into MUDA limits (MUDA Website).

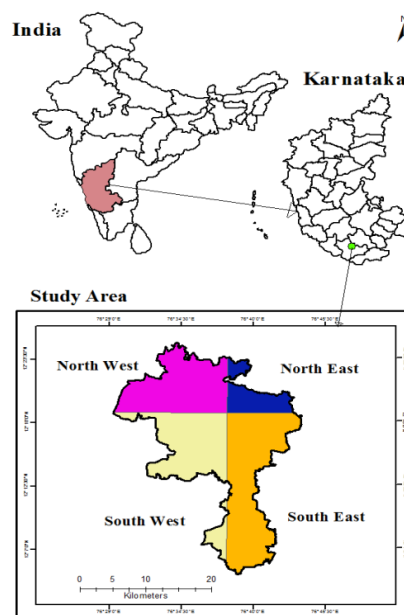


Figure – 1: Local Planning District of Mysore City

Mysore city has seen massive increase of built-up (from 80.71 sqkm in 2000 to 226.72sqkmin 2016) which triggered a drastic land-use land cover change in the last two decades. The study of urban growth using landscape metrics and Shannon entropy in the Mysore city reveals that urbanisation has become more dispersed and fragmented especially towards south direction of the city and dispersed growth (sprawling) is shifting from inner zones to outer zones of the Mysore city (Manjunatha and Chandrashekara, 2021).

4. Methodology

The study adopted the “questionnaire survey method” wherein a structured questionnaire is served to randomly selected public to obtain their perspective regarding impact of scattered urbanisation on the peripheral agriculture fields and water bodies in the Mysore city. For the purpose of micro level analyses, the study area has been divided into four zones such as a) North-East b) North-West c) South-East and d) South-West. The primary survey has been conducted and answers obtained from native people (villagers) of all four zones separately. Overall, 200 villagers with 50 from each zone have been met and collected data regarding impact of scattered urbanization (development of new layouts) around their villages on agriculture and water bodies. The questionnaire includes various dimensions of agriculture such as ownership of agriculture land, sale of their land, reason for sale of their land, existence of agricultural fields in nearby locality in the past and conversion of agriculture fields as built up have been investigated. Further, to assess the impact on water bodies, study analyzed the encroachment of water bodies and feeder channels, grade of the lakes (quality) and reasons for bad /worst state of the water bodies. The collected data has been analyzed using Microsoft excel and SPSS software.

5. Results and Discussion

5.1. Impact of urban sprawl on Agriculture

Scattered urbanisation at the periphery of the cities is common now. Growth of dispersed group of houses as packets of built-up and associated infrastructure development such as roads, electricity, water supply etc. naturally demands more land. Thus, newly growing localities are likely to swallow more and more fields once providing vegetables, flowers and food grains around the old cities. In this connection, the following section aims to study the various aspects relating to conversion of agriculture fields around Mysore city through having interview with neighboring villagers. The study analyzes the ownership of agriculture land, sale of their land, reason for sale of their land, existence of agricultural fields in nearby locality in the past and conversion of the agriculture fields as built-up to evaluate the degree of impact of urban sprawl on agriculture.

Table 1: Response of villagers (native people) regarding ownership of agricultural land

Directions /Response	Owning agricultural land	Have you sold your land	% of agriculture land sold
North-East	38	25	65.8%
North-West	45	41	91.1%
South-East	45	36	80.0%
South-West	46	37	80.4%
Total	174	139	79.9%

Table 2: Reasons for sale of their Agriculture land

Directions /Response	Reason for sale of their land			
	Low return	Shortage of labour	Real estate	Any others
North-East	3	5	17	-
North-West	-	5	36	-
South-East	6	6	24	-
South-West	-	3	34	-
Total	9	19	111	-
% of total	6.5%	13.7%	79.9%	-

According to table 1 and 2, about 79.9% surveyed residents of villages have sold their land partially or completely. The main motive of selling their land is real estate boom (heavy price for their land) followed by shortage of labor and low returns from agriculture. The highest sale of land is reported in the North-West direction (i.e. 91.1%) followed by South-East direction (i.e. 80.4%). The aforesaid reasons for sale their land is common in all the directions.

Table 3: Response of villagers regarding existence of agricultural fields in nearby locality in the past and conversion of the agriculture fields as built up

Directions /Response	Have you seen agriculture fields	Is agriculture area near your locality declining?			
		Strongly agree	Agree	Disagree	Strongly disagree
North-East	50	30	12	8	-
North-West	50	42	4	4	-
South-East	50	26	14	10	-
South-West	50	35	5	10	-

Total	200	133	43	24	-
% of total	-	66.5%	17.5%	16.0%	-

Table 4: Response of villagers regarding reasons for decline of agriculture fields

Directions /Response	If strongly agreed or agreed, what are the reasons for decline?			
	Conversion as layouts	Low return	Labour shortage	Any other
North-East	30	12	8	-
North-West	42	4	-	-
South-East	36	4	-	-
South-West	33	7	-	-
Total	141	27	8	-
% of total	80.11%	15.34%	4.55%	-

As per the table 3 and 4, all the surveyed residents have seen agriculture lands near their locality in the past. Among them about 66.5% have strongly agreed and about 17.5% have agreed that agriculture fields near their locality is declining due to conversion of agriculture fields as layouts. The highest number of strongly agreed and agreed farmers is reported in the North-West followed by North-East direction. The reason for sale their land in these directions is conversion of agriculture fields as layouts.

The significant reason for sale of agriculture fields in the peripheral areas of Mysore city is real estate boom (heavy price for land) which resulted due to growth of industry and commerce, increased job opportunities and income, development of roads especially in the outskirts of the city (inner ring road) etc. The massive conversion of agricultural fields into urban areas at the outskirts of Mysore city makes the vast fertile fields into fragmented small land holdings. Growth of packets of houses across the agriculture fields discouraged the farming activities.

In a nutshell, fertile agriculture fields of several villages around the Mysore city now converted into layouts or land left vacant to be used for development of layouts in future due to boom in real estate. Besides the layouts developments, several other constructions built around the city and also development of roads especially ring road gives rise to the massive expansion of built-up over the period of time.

5.2. Suggestions to create awareness regarding negative impacts of urban sprawl

- Community should be educated regarding negative impacts of urban sprawl.
- Community can challenge the local project lobby by voting in favor of councilors who floats more sustainable development methods in urbanization.
- Smart growth is designed to combat urban sprawl by developing in a way that does not jeopardize the land or community.
- Town planners and architects should promote smart growth by planning to promote and develop stronger sense of place through a more compact way of development, also known as mixed land use. Mixed land use development includes residential areas with places of employment and commerce instead of isolated individual areas.

5.2. Impact of urban sprawl on water bodies

To evaluate the impact of urban sprawl on water bodies in the Mysore city, study analyzed encroachment of water bodies and feeder channels, grade of the lakes (quality) and reasons for bad /worst state of the water bodies, details as follows.

5.2.1 Encroachment of water bodies and feeder channels

Table 5: Response of villagers regarding water bodies

Directions /Response	Have you seen water bodies near your locality?	
	Yes	No
North-East	40	10
North-West	46	4
South-East	48	2
South-West	45	5
Total	179	21
% of total	89.5%	10.5%

Table 6: Response of villagers regarding encroachment of water bodies due to construction

Directions /Response	Water bodies encroached due to construction	
	Yes	No
North-East	35	15
North-West	41	9
South-East	31	19
South-West	30	20
Total	137	63
% of total	68.5%	31.5%

Table 7: Response of villagers regarding encroachment of feeder channels

Directions /Response	Feeder channels encroached by built up	
	Yes	No
North-East	35	15
North-West	35	15
South-East	25	25
South-West	33	17
Total	128	72
% of total	64%	36%

According to 5, 6 and 7, about 89.5% surveyed residents have seen water bodies near your locality in the past. Among them 68.5% have agreed that these water bodies are being encroached and 64% have agreed that feeder channels of these lakes are also being encroached due to urban growth. The highest residents that agreed that water bodies are being encroached due to urban growth is reported from North-West followed by North-East direction. With regards

to feeder channels distraction highest reported from South-West followed by North-East direction.

5.2.2. Grade (Quality) of the lakes

The quality of the lakes has been measured through interview with randomly selected local community. If the lake is in good condition number 1 is assigned, if it is bad and worst number 2 and 3 has been assigned respectively. With regard to reasons for bad/worst condition of lakes, letter 'A' means discharge of sewage, 'B' means dumping of debris and 'C' means encroachment of lake area has been assigned, details as follows.

A. North-East direction

Table 8: Name of the Lakes, their Grade and reasons for bad/worst

Si. No	Name of the Lake	Grade	Reasons for bad/worst
1	Hanchyakere	2	A,B
2	Doddammankere	2	A,B,D
3	K KHundikere	3	A,B
4	Hoosakere	3	A,B,C
5	Katte	1	-
6	Hosakatte	2	A,B,C

Among the 6 lakes of the North East direction, K. K. Hundikere and Hoosakere are in worst condition due to discharge of sewage and dumping of debris. In addition, Hoosakere is facing problem of encroachment also. Hanchyakere, Doddammankere and Hosakatte are in bad condition due to discharge of sewage and dumping of debris. Besides, Doddammankere is facing problem of encroachment also and Hosakatte is facing problem of poor maintains. Only one i.e. Katte is in good condition. About 83% of lakes in this direction are in bad to worst condition.

B. North-West direction

Table9: Name of the Lakes, their Grade and reasons for bad/worst

Si. No	Name of the Lake	Grade	Reasons for bad/worst
1	Hallakatte	2	A,B
2	Kemmanahallikere	2	A,B,D
3	Chikkere	2	A,B
4	Hoskere	2	A,B,C
5	Manchappankere	2	A,B,C
6	Kurmakatte	2	A,B,C
7	Baavikere	1	-
8	Kunchagatte	3	A,B,C
9	Mallanakatte	1	-
10	Havverahallikere	1	-
11	Kodigundi	1	-
12	Gangegowrikola	1	-
13	MyidanahalliKere	1	-
14	Elavallakere	3	A,B,C
15	Basthipuradakere	1	-

In the North-West direction, Kunchagatte and Elavallakere are in worst condition due to discharge of sewage, dumping of debris and encroachment. There are six lakes viz., Hallakatte, Chikkere, Hoskere, Manchappankere, Kurmakatte and Kemmanahallikere are in bad condition due to discharge of sewage and dumping of debris. In addition, Hoskere, Manchappankere and Kurmakatte are facing encroachment problem whereas Kemmanahallikere facing lack of maintenance problem. The remaining 7 lakes are in good condition in this direction. About 53% of lakes in this direction are in bad to worst condition.

C. South-East direction

Table10: Name of the Lakes, their Grade and reasons for bad/worst

Si. No	Name of the Lake	Grade	Reasons for bad/worst
1	Dalavaykere	1	-
2	Enneholekere	1	-
3	Devalapurakere	1	-
4	Madapurakere	1	-
5	Yandhalhikere	1	-
6	Madhapurakere	1	-
7	Valarkatte	1	-
8	Kammargatta	1	-
9	Dhalinkatte	1	-
10	Varanakere	1	-
11	Erekatte	1	-
12	Channayakanakatte	1	-
13	Vadakehalla	1	-
14	Kamanakere	3	A,B,C
15	Kolchkatte	3	A,B,C
16	Jwandkatte	2	B
17	Uttanahallikere	1	-
18	Masandkatte	1	-
19	Siddanakatte	1	-
20	Katte	1	-

In the South-East direction, Kamanakere and Kolchkatteare are in worst condition due to discharge of sewage, dumping of debris and encroachment. There is only one lake viz.,Jwandkatteis in bad condition due to dumping of debris. Fortunately, 17 lakes of this direction are in good condition. About 15% of lakes in this direction are in bad to worst condition.

D. South-West direction

Table11: Name of the Lakes, their Grade and reasons for bad/worst

Si. No	Name of the Lake	Grade	Reasons for bad/worst
1	Chikkere	2	A,B
2	Dodkere	2	A,B
3	Puradakere	1	-
4	Doddakaate	2	A,B,C
5	Kaate	2	A,B,C
6	Yelaragundi	2	A,B
7	Lingabudikere	3	A,B,C
8	Harnkere	3	A,B,C
9	Kumbaragundi	3	A,B
10	ParasyinundiKere	2	A,B,C
11	LigabudikereKoodi	3	A,B,C
12	Ainakatte	3	A,B,C
13	Hundikatte	1	-
14	DhanagalliKere	1	-
15	Jhodgatte	1	-
16	Swallikere	1	-

17	Yadahallikere	1	-
18	Ballahallikere	1	-
19	Maratikatanahallikere	2	A,B,C

In the South-West direction, Lingabudikere, Harnkere, Kumbaragundi, LigabudikereKoodi and Ainakatte are in worst condition due to discharge of sewage, dumping of debris and encroachment. However, there is no encroachment problem in Kumbaragundi. There are 7 bad condition lakes in this direction. Among them Chikkere, Dodkere and Yelaragundi are bad due to discharge of sewage and dumping of debris. Doddakaate, Kaate, ParasyinundiKere and Maratikatanahallikere are bad due to discharge of sewage, dumping of debris and encroachment. There are 7 good condition lakes in this direction. About 63% of lakes in this direction are in bad to worst condition.

In a nutshell, there has been a huge encroachment of water bodies and feeder channels in the Mysore city. The highest decline of water bodies and feeder channels reported from North-West followed by North-East direction due to extensive growth of layouts. Highest bad to worst condition of lakes are reported from North-East direction followed by South-West direction.

5.2.3. Suggestions to maintain lakes in good condition

- All the lake boundaries should be demarcated and fenced.
- Lakes should be properly managed by allowing private companies to maintain, encouraging fishery, creating botanical gardens and recreation facilities in the phased manner etc.
- Avoid releasing sewage and dumping debris into lakes.
- Feeder channels of the lakes should be surveyed and maintained in its original status.
- Lakes which are currently polluted should be rejuvenated by purifying water preferably in the North-East direction where 93% lakes are polluted.
- A buffer zone with 2 km radius around the lakes should be reserved and any type of construction in that zone must not be allowed.

7. Conclusion

The present study reveals that a large number of farmers of peripheral villages of Mysore city have sold their agriculture fields due to real estate boom (heavy price for their land) and conversion of agriculture fields as layouts. The directional analysis reveals that conversion is

more intensive towards the northern direction of the city. It is largely a consequence of the extremely low price of agriculture land compared to already urbanized land or former industrial sites. In many land development projects or layout formation, cost of agricultural land acquisition is relatively low. It enables greater profits to be made compared to those from already urbanized land. The newly developed residential layouts and commercial establishments require more numbers and length of roads and related infrastructure which result in loss of agriculture fields and associated irreversible reduction in food production. The growth of industry and commerce, increased job opportunities and income, development of roads (inner ring road) etc. causes massive conversion resulting in fragmentation of vast fertile fields into small land holdings. Growth of packets of house across the agriculture fields also discouraging farming activities in the vicinity of the city. Awareness among local community should be created regarding negative impacts of urban sprawl. There has been huge encroachment of water bodies and feeder channels around the Mysore city. The villagers have also agreed that more number of lakes is in bad to worst condition due to discharge of sewage, dumping of debris and encroachment and it is more intensive towards north direction of the Mysore city. The concern local authorities (Mysore City Corporation and MUDA) should initiate measures to combat urban sprawling and develop strategies to minimize the impact on water bodies.

Reference

- Angel, S., Parent, J. and Civco, D., 2007. Urban sprawl metrics: An analysis of global urban expansion using GIS". ASPRS 2007 Annual Conference, Tampa, Florida.
- Bijender Singh. 2014. Urban Growth Using Shannon's Entropy: a Case Study of Rohtak City. Cloud Publications: International Journal of Advanced Remote Sensing and GIS. 3(1); 544-552.
- Burchell, R. W., Shad, N. A., Listokin, D., Phillips, H., Downs, A., Seskin, S., Davis, J.S., Moore, T., Helton, D. and Gall, M., 1998. The Costs of Sprawl--Revisited. Transit Cooperative Research Program (TCRP) Report 39, published by Transportation Research Board, Washington.
- Darío, R. B., 2014. Urban sprawl and city compactness. A proposal for regional sustainability indicators. Case study of the towns of Alcorcon and Majadahonda. World SB 4, Barcelona.
- Glaeser, E. L. and Kahn, E. M., 2003. Sprawl and Urban Growth. In: Handbook of urban and regional economics. Eds: V. Henderson J.F. Thisse. Elsevier Publishers.

- Kuchay, N., and Bhat, S.M., 2014. Urban sprawl of Srinagar city and its impact on wetlands-a spatio-temporal analysis. *International Journal of Environment and Bioenergy*. 9(2); 122-129.
- Ojima, R., and Hogan, J.D., 2009. Mobility, urban sprawl and environmental risks in Brazilian urban agglomerations: challenges for urban sustainability. In: *Urban Population-Environment Dynamics in the Developing World: Case Studies and Lessons Learned*. Eds: de Sherbiniin, A., A. Rahman, A. Barbieri, J.C. Fotso, and Y. Zhu. Paris: Committee for International Cooperation in National Research in Demography (CICRED).
- Ramachandraiah, C., and Prasad, S., 2004. Impact of urban growth on water bodies: the case of Hyderabad. Working Paper No. 60. Centre for Economic and Social Studies.
- Shalaby, A.A., Ali, R.R., and Gad, A., 2012. Urban sprawl impact assessment on the agricultural land in Egypt using remote sensing and GIS: a case study, Qalubiya Governorate. *Journal of Land Use Science*. 7(3); 261-273.
- Sierra Club., 1998. *The Dark Side of the American Dream: The Costs and Consequences of Suburban Sprawl*. Washington, D.C.
- Torrens, P.M. and Alberti, M. 2000. Measuring sprawl, working paper no. 27, Centre for Advanced Spatial Analysis, University College, London.