

# An analysis on the impact of human over population in India on the environment using Induced Fuzzy Cognitive Map Model

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## Abstract

Human overpopulation is one of the dominant causes in India that affects the environment. Overpopulation is a detrimental condition when the number of the present human population exceeds the carrying capacity of Earth. Reduced loss of life due to better medical facilities, reduced mortality and increased natality rate are few causes which result in overpopulation. Impact of overpopulation on the environment needs thorough analysis, which can be easily performed by using the mathematical model namely Induced Fuzzy Cognitive Maps (IFCMs). IFCM is an advancement of FCM which is a fuzzy-graph model.

**Key words:** *Lepidagathis cristata*, anti-inflammatory, analgesic, immunosuppressive

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## INTRODUCTION

Lotfi A. Zadeh developed the concept of fuzzy as an extension of the typical perception of set. A Cognitive Map (CM) can be described as a qualitative model of how a system operates. The map is based on defined variables and the causal relationship between variables. These variables can be physical quantities that can be measured such as the amount of precipitation or percentage of vegetative cover or complex and abstract ideas like aesthetics and political ideas (Kandasamy and Smarandache, 2003). Fuzzy Cognitive Maps (FCMs) are more appropriate tool when the data in the first place are an unsupervised one. FCMs model the world as a group of classes and causal relationships between classes (Kosko, 1986). This method is the most simple and an adequate one as it can analyze the data by directed graphs and connection matrices (Kandasamy and Smarandache, 2003).

Fuzzy Cognitive Maps (FCMs) are a directed graph with concepts as nodes and casualities as edges. Consider the nodes/concepts  $C_1, C_2, \dots, C_n$  of the FCM. Using edge weight  $e_{ij} \in [-1, 0, 1]$ , the directed graph is drawn, where  $e_{ij}$  is the weight of the directed edge  $C_i \rightarrow C_j$ .  $E$  is called the adjacency matrix/connection of the FCM. If the equilibrium state of a dynamical system is a unique state vector, then it is called a fixed point. Consider an FCM with  $C_1, C_2, \dots, C_n$  as nodes. If the FCM settles down with  $C_1$  and  $C_n$ , the state vector

remains as  $(1, 0, 0, \dots, 0, 1)$ . This state vector is called the fixed point. If the Fuzzy Cognitive Map settles down with a repeating state vector in the form,

$A_1 \rightarrow A_2 \rightarrow \dots \rightarrow A_i \rightarrow A_1$  then this equilibrium is called a limit cycle. This paper discusses the concept of Induced Fuzzy Cognitive Maps (IFCMs) which is the developmental study of FCM (Ghosh and Pal, 2015)

## Algorithmic approach of IFCM

IFCM follows the foundation of FCM. It has a slight modification only in the algorithm. To deal with the unsupervised data IFCM gives the optimal solution to the problem, the following steps to be followed (Ghosh and Pal, 2015).

Step 1: Collect the unsupervised data related to the problem which are determinant.

Step 2: Draw the graph with expert consultation.

Step 3: Obtain the matrix  $M$ , from the graph (FCM).

Step 4: Consider the state vector  $(F_1)$ , which is in ON position. Find  $F_1 \times M$ . Update and threshold the resultant state vector at each stage.

Step 5: Assign 1 for the values  $> 0$  and 0 for the values  $< 0$  for the calculation of the threshold value.

Step 6: In the  $A_i$  Vector, each component is taken and the product of the given matrix is calculated. The resultant vector is considered as  $A_2$  which has the maximum number of one's.

Step 7: If the same threshold value occurs twice, then the value is considered as fixed point.

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Step 8: Consider the state vector  $F_2$  in terms of  $F_1$  in ON state. Proceed the calculations discussed in steps 4 to 6.

Step 9: Continue the above steps for all the remaining state vectors and find hidden pattern.

### Comparison between FCM and IFCM

FCMs have several advantages of various fuzzy logic. It is one of the methods that gives importance to human (expert's) knowledge and easy to handle. First, when the matrices have a larger number of rows and columns it has a lengthy procedure for calculation. Second, the calculations fully depend on the expert's opinion. The graphical representation of IFCM is much more comfortable while compared with FCM. It is a predictable method to deal with the unsupervised data and also shows the intermediary node which helps us to analyze the given problem (Ghosh and Pal, 2015).

### Description of the problem

Population growth and distribution have important roles to play in the viability of the world's vast resources. Not only the number of people, but also the lifestyle, depletion patterns, and regions people inhabit and use directly influence the environment. The relationship between population size and environmental decline may appear to be relatively straightforward. A large number of people demand more resources and generate more waste. One of the main challenges of a population growth is that the mere existence of so many people sharing a limited resources stresses the environment. But when looking at the effect of human activities, the situation is more complex due to the wide variety of administration policies, technologies, and decreasing patterns worldwide. The connection between population growth and the environment is identified somewhere between the view that population growth is only accountable for all environmental ills and the view that a large number of people means the development of new technologies to overcome any environmental problems. Most environmentalists coincide that population growth is only one of several interacting factors that place pressure on the environment. Peak levels of consumer and industrial development, inequality in wealth and land distribution, inappropriate government policies, poverty, and disorganized technologies all contribute to environmental decline. Overpopulation may not be a root cause in ecological decline, but rather just one factor among many that exacerbate or multiply the negative effects of other societal, economical, and political factors.

### Relevant Factors for Human population which affects the Environment.

Based on the research articles the following factors are framed.

- C<sub>1</sub>. Depletion of natural resources
- C<sub>2</sub>. Loss of ecosystems
- C<sub>3</sub>. Increased global warming and climate change
- C<sub>4</sub>. Species extinction
- C<sub>5</sub>. Elevated crime rate
- C<sub>6</sub>. Poverty and family problems.
- C<sub>7</sub>. Social pressures (early pregnancy)
- C<sub>8</sub>. Lower life expectancy in the fastest growing countries
- C<sub>9</sub>. Increased emergence of new epidemics and pandemics
- C<sub>10</sub>. Urbanization
- C<sub>11</sub>. Migration

C<sub>1</sub>: Depletion of natural resources: As the human population continues to burst, it placing competitive stress on the basic life sustaining resources and leading to a diminished quality of life.

C<sub>2</sub>: Loss of ecosystems: Biodiversity on earth is decreasing at an alarming rate. It is estimated that 140,000 species are lost every year. This is caused by pollution, weather change, destruction of habitats, and poaching, all of which are man-made problems. Biodiversity is not only a problem in itself, but it also produces many other problems. Along with the various species that are lost every time, ecosystems are destroyed by the day. The destruction of these ecosystems has seismic effects on our lives and our future.

C<sub>3</sub>: Increased global warming and climate change: "The largest single risk to the ecology and biodiversity of the planet in the decades to come will be global climate disruption due to the build-up of human-produced greenhouse gases in the atmosphere. Around the world, people are beginning to initiate the problem by reducing their carbon footprint through less consumption and better technology development.

C<sub>4</sub>: Species extinction: According to the survey, 63,837 species examined worldwide, 19,817 are threatened with extinction which is one third of the total. If the present situation continues, within a few decades at least half of the species on earth will be extinct.

C<sub>5</sub>: Elevated crime rate: As human population needs resources and basic necessities, such as food and water, there will be raising competitiveness for these

resources which leads to rise in crime rates due to drug cartels and theft by people in order to survive.

C<sub>6</sub>: Poverty and family problems: The experience of long-term poverty changes the child’s personality development, through a family stress process in which poverty is considered to be one of the main factors. This causes family dysfunction, stress among caregivers and inadequate parenting.

C<sub>7</sub>: Social pressures (early pregnancy): Child marriage is a dangerous reality. It speeds population and worsens maternal and infant health outcomes. By not tapping the potential economic productivity of all its members it keeps people in poverty. Desmond Tutu said, It’s been shown that where child marriage is in practice. You can forget clearly gender equality. You can forget about education because a girl leaves school and she gets married, you can forget about decreasing poverty as she is hardly likely to earn a great deal with no education.

C<sub>8</sub>: Lower life expectancy in the fastest growing countries: As per the study, Nearly (97%) of the 2.3 billion projected increase will be in the less developed regions, with almost half (49%) in Africa.” Already strained with relentless population explosion, many emerging countries, such as in Sub Saharan Africa and Southern Asia, will experience a degradation of their quality and length of life as they face continually increasing difficulties to supply water, food, energy, and housing to their growing populations, which will have main repercussions on public health, security measures and economic growth.

C<sub>9</sub>: Increased emergence of new epidemics and pandemics: A WHO report says that environmental degradation, combined with the growth in world population, is a major cause of the rapid increase in human ailments, which contributes to the malnutrition of 3.7 billion people worldwide, making them more susceptible to disease. Population growth exacerbates many social and ecological factors, including overcrowded living conditions, malnutrition and inadequate or non-existent health care, which reek havoc on the poor and increases their likelihood of being exposed to infectious diseases.

C<sub>10</sub>: Urbanization: Urbanization is an index of conversion from traditional rural economies to a modern industrial one. It is a long-term process. The necessity of jobs and prosperity, among other factors, pulls people to cities. Half of the people already live in cities; by the next 40 years, two-thirds of the human population is expected to live in urban areas. But in cities, the most two vital problems facing the world today also come together: poverty and environmental degradation.

C<sub>11</sub>: Migration: Immigration is the main problem in some parts of the world. If the inhabitants of various countries migrate to a particular part of the world and decided to settle in that region, the area has to face the negative effects of overpopulation. The area becomes overpopulated. People inhabiting the area experience scarcity of resources. This leads to uneven distribution of basic necessities which is a direct consequence of overpopulation.

**Implementation of IFCM model for the study**

According to the domain expert’s opinion the connection matrix M associated with the IFCM obtained as,

$$\begin{matrix}
 & C_1 & C_2 & C_3 & C_4 & C_5 & C_6 & C_7 & C_8 & C_9 & C_{10} & C_{11} \\
 \begin{matrix} C_1 \\ C_2 \\ C_3 \\ C_4 \\ C_5 \\ C_6 \\ C_7 \\ C_8 \\ C_9 \\ C_{10} \\ C_{11} \end{matrix} & \begin{pmatrix}
 - & 0.9 & -0.8 & 0.7 & 0.4 & 0.2 & 0.6 & 0.4 & 0.7 & 0.8 & 0.1 \\
 1 & - & 0.9 & 0.7 & 0.2 & 0 & 0.6 & 0.5 & 0.8 & 0.9 & 0.6 \\
 -0.8 & 0.9 & - & 0.5 & 0.4 & 0.9 & 0.8 & 0.8 & 0.7 & 0.6 & 0.7 \\
 0.9 & 0.8 & 1 & - & 0.4 & 0.3 & 0.5 & 0.6 & 0.7 & 0.6 & 0.7 \\
 0.2 & 0.6 & 0.4 & 0.2 & - & 0.6 & 0.4 & 0.7 & 0.6 & 0.2 & 0.4 \\
 0.4 & 0.3 & 0 & 0.3 & 0.8 & - & 0.8 & 0.8 & 0.7 & 0.6 & 0.8 \\
 0.3 & 0.4 & 0.3 & 0.3 & 1 & 0.8 & - & 0.8 & 0.6 & 0.3 & 0.9 \\
 0.8 & 0.9 & 0.8 & 0.6 & 0.9 & 0.7 & 0.9 & - & 0.9 & 0.7 & 0.9 \\
 0.8 & 0.7 & 0.6 & 0.5 & 0.4 & 0.6 & 0.5 & 0.7 & - & 0.6 & 0.5 \\
 0.9 & 0.8 & 0.7 & 0.6 & 0.4 & 0.4 & 0.9 & 0.7 & 0.6 & - & 0.9 \\
 0.6 & 0.4 & 0.5 & 0.4 & 0.8 & 0.7 & 0.8 & 0.7 & 0.5 & 0.9 & -
 \end{pmatrix} & 11 \times 11
 \end{matrix}$$

**Calculation**

**Step: 1** Consider F<sub>1</sub> in the step 1, by setting the concept F<sub>1</sub> to ON state, i.e., the first component of the vector is set to be 1 and the rest are assigned to 0.

$$F_{1_1} = (1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$$

(Product of F<sub>1</sub> and M is calculated)

$$\begin{aligned}
 F_1 \times M &= (0\ 0.9\ -0.8\ 0.7\ 0.4\ 0.2\ 0.6\ 0.4\ 0.7\ 0.8\ 0.1) \\
 &\rightarrow (1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) = A_1'
 \end{aligned}$$

The symbol → represents the threshold value for the product of the result.

Now,

$$A_2' = (1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1)$$

$$A_2' \times M = (1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \times M$$

Proceed the calculation as per in step 6. The symbol ~ represents the calculation performed with the particular vector,

$$\begin{aligned}
 A'_1.M &\sim (1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_1.M &= (0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 0\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_1.M &= (0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_1.M &= (0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_1.M &= (0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 0\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1) \\
 A'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1) \\
 A'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1) \\
 A'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1) \\
 A'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1) \\
 A'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0)
 \end{aligned}$$

$$A_2 = (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1)$$

$$\begin{aligned}
 A_2.M &= (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1).M = (4.2\ 5.2\ 3.5\ 4.8\ 5.3\ 4.9\ 6.3\ 6.1\ 6.1\ 5.4\ 5.8) \\
 &\rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) = A_2'
 \end{aligned}$$

$$\begin{aligned}
 A'_2.M &= (1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_2.M &= (0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 0\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_2.M &= (0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (0\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_2.M &= (0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_2.M &= (0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_2.M &= (0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 0\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 A'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1) \\
 A'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1) \\
 A'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1) \\
 A'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1) \\
 A'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1) \\
 A'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0)
 \end{aligned}$$

$$A_3 = (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1)$$

From the above derivation, the vector which has the maximum number of one's is found and let it be  $A_3$ .

$$A_3 = (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) = A_2$$

The fixed point is

$$A_3 = (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1)$$

As per the step 7,  $A_3$  is considered as a fixed point

**Step 2:** Let us consider  $F_3$  in the step 2,

$$F_3 = (0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$$

(Product of  $F_3$  and  $M$  is calculated)

$$F_3 \times M = (0.8\ 0.9\ 0\ 0.5\ 0.4\ 0.9\ 0.8\ 0.8\ 0.7\ 0.6\ 0.7) \rightarrow (0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) = B'_1$$

$$\begin{aligned}
 B'_1.M &\sim (0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 0\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_1.M &= (0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (0\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_1.M &= (0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_1.M &= (0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_1.M &= (0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 0\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1) \\
 B'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1) \\
 B'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1) \\
 B'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1) \\
 B'_1.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0)
 \end{aligned}$$

$$B_2 = (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1)$$

$$\begin{aligned}
 B'_2.M &= (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1).M \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_2.M &= (1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_2.M &= (0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 0\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_2.M &= (0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (0\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_2.M &= (0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_2.M &= (0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_2.M &= (0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 0\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1) \\
 B'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1) \\
 B'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1) \\
 B'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1\ 1) \\
 B'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 1\ 1) \\
 B'_2.M &= (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1) \rightarrow (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0)
 \end{aligned}$$

$$B_3 = (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1)$$

$$B_2 = B_3$$

The fixed point is

$$B_3 = (1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1)$$

Proceed the remaining steps in the above manner, the various fixed points are found.

In this study, the result of step 1 suggests that by keeping  $F_1$  in ON state, the fixed point  $A_3$  is obtained. More precisely, the factors such as ( $C_1$ ) Depletion of natural resources ( $C_2$ ) Loss of ecosystems ( $C_3$ ) Increased global warming and climate change ( $C_5$ ) Elevated crime rate ( $C_6$ ) Poverty and family problems. ( $C_7$ ) Social pressures (early pregnancy) ( $C_8$ ) Lower life expectancy in the fastest growing countries ( $C_9$ ) Increased emergence of new epidemics and pandemics ( $C_{10}$ ) Urbanization ( $C_{11}$ ) Migration is considered as an influencing factor of  $C_1$ . In a similar manner, the result of step 2 is discussed. By keeping  $F_3$  in ON position, fixed point  $B_3$  is obtained.  $B_3$  contains the same factors which are discussed in step 1.

In the present study the above results are worthy of consideration. First, by observing the calculation of IFCM done in the above steps, it is explicitly shown that the vector which has the maximum number of 1's is considered as the fixed point. In both the steps we obtain the fixed point vector as

$$A_3 = (1 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1)$$

That is, the factors such as 1,2,3,5,6,7,8,9,10 and 11 are the main implicated factors except the fourth factor (Species extinction). So for any common factors as we have taken as attributes 1 to 11, the above are the casualties.

The present study that examines the effects of each attributive factor that are taken. Also, it yields the most impactful factors for a Human population which affects the environment.

## CONCLUSION

All the above environmental issues clearly indicate that the natural resources that humans take for granted are in grave danger. Most of the loss of the environment caused by human extension is long-lasting and in some cases permanent. Undoubtedly, the human population will continue increasing and the condition of the environment will exacerbate. For that reason, only a balanced approach towards conserving what currently exists as natural resources could counteract the harmful effects of overpopulation in the natural world.

Preserving human overpopulation is feasible through widespread availability of family planning, spreading awareness on the impacts and effects of overpopulation, providing easier access to birth control devices and establishing social patterns, such as social marketing strategies, to educate the public (especially in developing countries).

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