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Business Activity and Environmental Quality in Iran

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Abstract: Positive economic growth rates reflect economic boom in a period of time whereas negative economic growth rates reflect economic recession. Improving business environment results in an increase in economic growth as well as efficiency through increased production, employment, etc. The environment is considered as a key element in sustainable development. In recent decades, the importance of the environment has gradually increased and environmental quality has gained a considerable importance so that alongside the growth and development of communities, the quality of the environment has become more significant. The aim of this study was to evaluate the effect of economic indicators of business on the quality of the environment in Iran during the years, 1981-2014, using Bayesian Causal Map (BCM) in five scenarios. The impact of changes in economic variables on the rate of growth of CO_2 emissions was done with the use of one-way sensitivity analysis and it was found that among from the four indicators, business, private credit, taxes and then energy consumption and ultimately private sector investment had the highest impact on CO_2 emissions. Also, the results of the five scenarios show that after the change in the probability conditions, CO_2 emission is more likely to happen.

Key words: Bayesian causal map, business, emission, indicator, environmental quality

INTRODUCTION

Institutional environment where all economic businesses form survive or bankrupt and get out is called business environment of economic activities. Such environment has a critical and decisive role in the entry, growth and development and exit of economic enterprises. Despite the augmentation of important factors such as labor and capital, one of the main challenges of economic growth is the emergence of an environment where entrepreneurs and economic agents ranging from enterprises and investors are active in the business. In the current situation of the world, a growing consensus has been formed on the efficient functioning of the increased share of private sector in economy. Economists focus on the issue of privatization and reduced government intervention because the widespread presence of the state in all economic spheres fades the motivation of entrepreneurs and private sector in economy. So, to convert the state economy to non-state economy the strategy of improving the business environment can be used rather than privatization strategy (Baseri and Hoseini, 2010). Also, the World Bank has been a suitable guide for investors and planners of various countries by reporting the business environment. The report was published in 2004 and in the 1st year of its release, it studied the business environment of 133 countries through five indicators. In the years following the publication of the project's business environment, the number of countries and indicators increased so that in the 2014 report, it studied 189 countries and ten indicators in which Iran ranked 130. Ten indicators of business environment reported in 2014 by the world bank listed include starting a business, dealing with construction permits, getting electricity (energy), registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts and resolving solvency. The world bank compares and ranks the countries based on the same indicators. Therefore, countries that do not have a suitable place among the countries surveyed can model successful and leading countries to obtain proper place and provide economic growth and prosperity.

According to economic theories, economic growth shows changes in economic activity of a country or region in a specific period of time (positive or negative). Positive economic growth rates reflect economic boom in a period of time whereas negative economic growth

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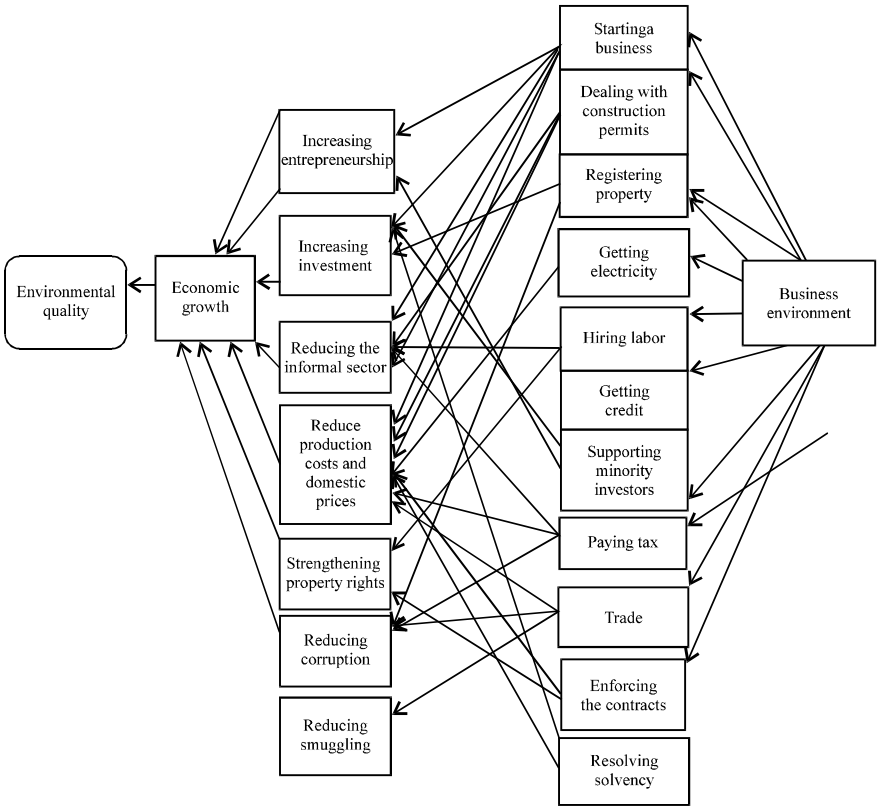

Fig. 1: Effective routes for business indicators on environmental quality

rates reflect economic recession. Improving business environment results in an increase in economic growth and efficiency through increased production, employment, etc. In the current economy, determinants of economic growth have become one of the controversial and considerable issues among economists. Undoubtedly, one of the greatest concerns of authorities and decision-makers in every country is the economic situation of that country. Over the last decades, to increase the rate of economic growth, various countries have adopted a variety of tools and policies. The use of these tools and policies has sometimes resulted in increased economic growth and sometimes backfired in some countries. More economic growth requires greater use of energy and raw materials that in turn results in a higher level of environmental degradation and the decline of environmental quality (Fig. 1).

Greenhouse and toxic gases resulting from fossil fuel combustion have undeniable environmental impacts. Sulfur oxides, nitrogen oxide, carbon monoxide, particulate matter, hydrocarbons and carbon dioxide are among greenhouse gases which are released to the atmosphere. Toxic gases such as CO, SO_x and NO_x cause acid rain, health risks to human and other organisms and are mainly regarded from the perspective of regional and national interests. It should be noted that greenhouse gases such as carbon dioxide cause the phenomenon of climate change and global warming and are globally important. About 55% of the greenhouse gases are attributed to carbon dioxide. Despite water pollution which has immediate and identifiable effects on health, the emission of carbon dioxide is harmless in short run but affects the environment in the long term (Nasrollahi and Gulek, 2009). Given the increasing importance of carbon dioxide in air pollution and global warming phenomenon in this study, carbon dioxide has been considered as a measure of environmental quality and pollution. Due to the existence of huge reserves of fossil fuels, conservation of energy has not been a serious matter in Iran. In terms of environmental sustainability, Iran was ranked as 83 among 178 countries among of world, i.e., in the middle of the table. In this Table 1 where 178 countries have been evaluated in terms of environmental, social and economic situation, Switzerland, Luxembourg, Australia, Singapore, czech republic and germany were in the first to sixth place in the world, respectively. With 51.8 points, Iran was ranked as 83 in the world after countries such as Brazil, Thailand Trinidad and Tobago, Palau and Morocco. Accordingly, the current study examines the relationship between business environment and environmental quality

indicators in Iran over the time period of 1981-2014. Because according to the current debate about global warming, air quality and other environmental matters, better understanding of the relationship between economic and environmental indicators can help Iran planners and policy makers in determining and approving environmental and commercial policies.

Literature review: To investigate the changes in environmental quality resulting from economic activity in many cases, EKC is used. In terms of economic and environmental quality indicators, several studies have been done in the country and abroad that some of them are mentioned below.

Pajooyan and Zadeh (2010) assessed factors influencing the relationship between economic growth and environmental quality. Their findings show that despite the positive impact of economic growth on emissions, improving technology to reduce sulfur dioxide and nitrogen pollutants and improving the political effect in reducing carbon dioxide emissions play an important role.

In their research, Pahlavani *et al.* (2013) investigated the impact of the development of trade and economic growth on environmental quality. The results showed that there is a long-run equilibrium relationship between trade openness, GDP, urban population, energy consumption and air pollution indicators. In short-term, the variables of urban population and energy consumption have had the highest impact on the amount of SO_2 production whereas in long-term, per capita energy consumption have had the highest impact on SO_2 pollution.

In their study, Sadeghi and Ebrahimi (2013) examined the impact of financial development, GDP, energy consumption and environmental pollution in Iran. The results showed that in the long run, GDP, energy consumption and carbon dioxide emissions have a significant effect on trade liberalization and the elimination of variable power consumption of the model. The variable ratio increased carbon dioxide emissions. In addition, the results of the environmental Kuznets curve was approved for Iran's short and long term.

Shahbaz *et al.* (2013) studied the effect of economic growth, energy, financial development and trade openness on their CO_2 emissions in Indonesia. In their study, per capita domestic real credit to the private sector was considered as a measure of financial development. The results showed that economic growth in Indonesia increased energy consumption and CO_2 emissions while finance and business development decreased. Also, an inverted U relationship was confirmed between financial development and spread of CO_2.

In their study, Chaebi investigated the impact of business activities on the reduction of environmental quality in Mexico. The obtained results showed a strong integration between the variables and along-term relationship between energy consumption and the growth of business activities was observed. It is possible that energy savings policy resulted in the reduction of national income and employment.

In their study, Piaggio and Padilla (2012) examined the relationship between emissions and economic activity in 31 countries during the years 1950-2006. Using analytics accumulation of long-term relationships, the relationship between pollution and economic activities in different countries was confirmed.

In their study, Becker *et al.* (2013) investigated whether environmental regulations in the united states is due to the size of the business or not. Their research results showed that the operating cost cuts and economic costs of reducing pollution per unit is a function of the size of the facility, industry, state and year. They also showed that the intensity of the costs and facility costs and reduced pollution by plant size increases.

In their research, Emil and Emil (2014) examined Kuznets curve hypothesis based on local pollutants (CO, VOC, SOx, NOx) and global (CO_2, GHG) and OECD countries using panel data. The obtained results showed that the shape of U which shows the relationship between pollution income for all gases is not upside down. EKC for CO, VOC and NOx is significant for CO_2 curve is monotonically increasing. For GHG signs of EKC but more countries are on the increase curve.

MATERIALS AND METHODS

In this study in order to analyze the role of economic indicators of business environmental change Bayesian Causal Map (BCM) Method was used which is appropriate for modeling in uncertain conditions and useful to identify a policy that has been done by government officials. Especially when information and data are rare, BCM shows the maps more descriptive than other models such as regression or structural equation and is a more useful tool for decision-making. Bayesian causal maps are the result of research in the field of artificial intelligence. Studies in the field of artificial intelligence emphasize the importance of knowledge in the addressed area as a means of decision-making. Using Bayesian causal maps as an aid to decision-making has several benefits and evidence from studies suggests that in >90% of cases, decision-makers have been successful in using such models due to eliminating unsystematic errors. Econometric models based on time series assume that future behavior of a system is similar to its past behavior which has many applications in simplifying the analysis; however in the real world, we cannot expect everything to be constant at any moment of time. In fact

this reality is noteworthy about some macroeconomic variables which are dynamic and are variable due to different uncertainties over time. Bayesian causal map is a combination of Bayesian map and Bayesian network in which Bayesian map is the graphical representation of expert knowledge of the subject under discussion and Bayesian network displays expert knowledge network based on probability theory. Bayesian network in which relationships are causal is called Bayesian belief network or causal probability network or Bayesian causal map. Because the Bayesian network framework has been designed on the basis of probability, the Bayesian causal map can be used for uncertainties associated with the variables in the map. Because of the combination of Bayesian causal map and Bayesian network, the model of Bayesian causal map enhances the capabilities of causal maps in various forms and using extension property (emission) of Bayesian network when additional information is obtained from other variables, more accurate can be done on the intended variables (Nadkarni and Shenoy, 2001).

Causal map: Causal maps are arrow diagrams that show latent causal relations lies in experts' minds. A causal map is a qualitative technique to identify the causal relationship between various concepts that determines individual beliefs about a particular area and at a specified time and explains decision-making about how to solve a problem through the following of a diagram and shows causal claims as a diagram. A causal map says that a certain incident leads to a specific result. This technique does not show the uncertainty associated with variables and that all the variables on the map are on the same level of certainty.

This technique shows knowledge, expertise and understanding in the form of causal relationships between the variables. Causal maps can be designed using theoretical documentary resources and based on theory. Causal maps have three components including:

Knots represent the concepts causal: The variables of interest in the map, the concepts are called causal.

Connections causal: Causal relationships between concepts to be shown. Such connections are displayed with unidirectional arrows. An arrow at the bottom of the cause of the flash head.

The causal connections: These show the amount of connections stretch (can be positive or negative) between the concepts of causal. There are several techniques to gain traction causal connection such as a matrix algebra, dynamic systems and Bayesian probabilities.

In general, causal map is a network of concepts (variables) and is formed of causal variables and negative and positive signs of the relationship between these variables and the connection between these two variables represent the dependency of the two variables while lack of connection shows that the two variables are independent. Difficult steps in causal maps consist of 3 steps: first, the selection of the approach of causal mapping, the second stage includes determining the set of variables and the third stage consists of the plan of the causal map. Since in making the complete causal map for the variables of the model examining the factors influencing the variables is needed, the internal and external reviews that examined the variables of the model as well as taking into account the economic conditions of Iran have been used. Thus, according to what was mentioned above, the general model to study economic scenarios affecting environmental quality indicator used in this study are as function:

$$EN = f(Tax, Energy, Trade, Credit, Invest) \quad (1)$$

The variables of Bayesian causal map include economic indicators and environmental quality, including the release of CO_2 (EN), Gross Domestic Product (GDP), Taxes (Tax), the Gini coefficient (Gini), protecting investors (Invest), Employment (E), Inflation (Inf), the real Exchange Rate (ER), Energy (Energy), the real price of Energy (EP), Trade (Trade), foreign direct investment (FDI), private sector Credit (Credit), private sector debt the banking system (DP) and Interest Rate (IR) in which the effect of the variables on each other characterized as functions Eq. 2-6. Equations stated in these functions represent causal connections in the preliminary causal map:

$$Tax = f(GDP, E, Gini) \quad (2)$$

$$Energy = f(EP, GDP, Trade) \quad (3)$$

$$Trade = f(GDP, Inf, ER, FDI) \quad (4)$$

$$Credit = f(GDP, DP, FDI, E, Inf) \quad (5)$$

$$Invest = f(IR, ER, Inf, Credit) \quad (6)$$

Statistical data used in this study have been extracted on an annual basis for the period 1981-2014 from the statistical resources of the Central Bank of Islamic Republic of Iran, Iranian Statistics Center and the World Bank (Fig. 2).

Bayesian network: Bayesian network is an attempt to represent the knowledge of experts in science expert, uncertain, ambiguous and incomplete areas. Bayesian

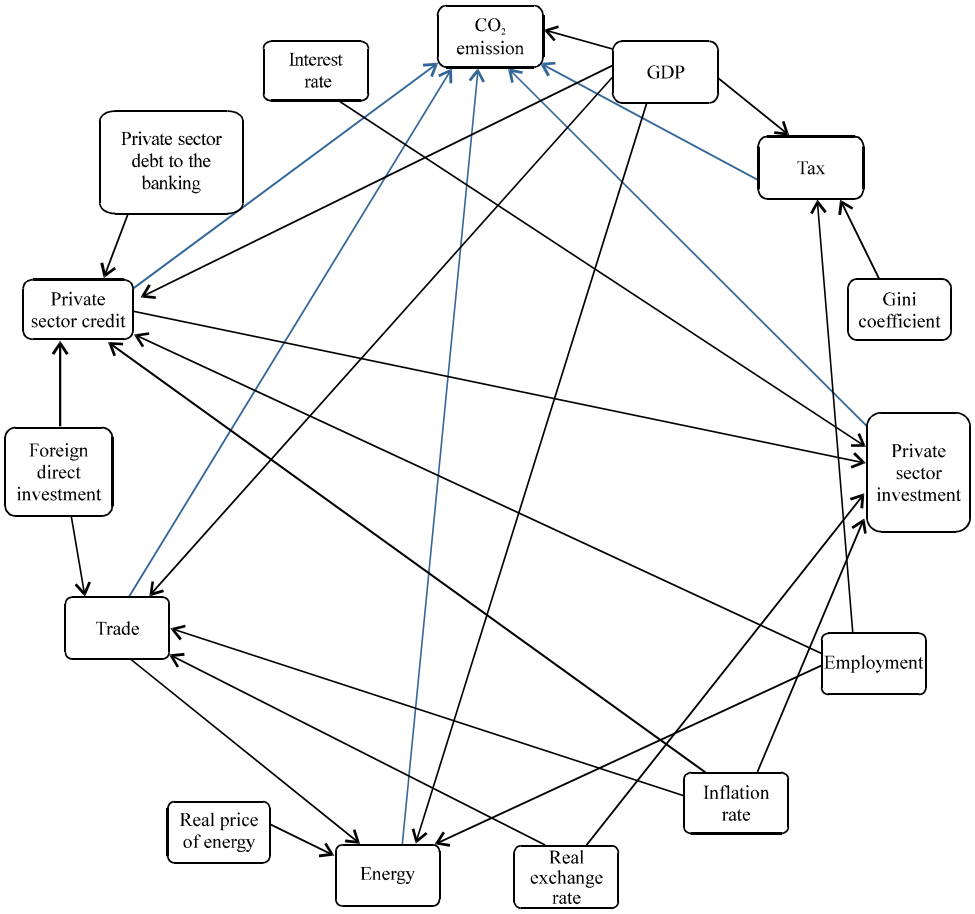

Fig. 2: Complete causal map of the research variables

network can be a compressed version displayed in uncertainty due to the fault called, because it is based on the theory of probability and joint probability distribution over the set of variables by specifying a set of conditional independent assumptions described with a set of conditional probabilities. Bayesian networks variable is provided for uncertainty framework for the network such as variables that are not included in the map. A common method to overcome the uncertainty of the variables in the network, measure the degree of confidence that the cause of the condition is variable. Parent: the process of measuring the confidence, the determination of the probability of variable former condition because of the amount of the net.

Bayesian network is comprised of two stages, the qualitative and quantitative phases. In qualitative stage, the quality of schematic structure of the network, including connections and non-rotating arrow represents the relationships between variables. Connections directional arrows that point to specific purposes and a non-rotation of the connectors is a way to start from one point and go through a set of connectors and back to the starting point does not exist. Bayesian network represents no connection between the two variables which are not independent variables and may be linked via an intermediary. So, these two conditions are independent and not unlike causal map represents independent variables connection of the other in this way there is no reason for the lack of connection between not changing. Then in little stage, relationships between variables can be expressed as a conditional probability distribution and with each variable table that the conditional probability distribution is likely to vary according to the cause of his show (Mitchell, 1997).

Topics Bayesian network starts with the definition of conditional independence: If according to Fig. 3, x, y and z are three discrete random variables it is said that x is a conditional independence of y if z is provided. If the probability distribution of x is independent of the value of

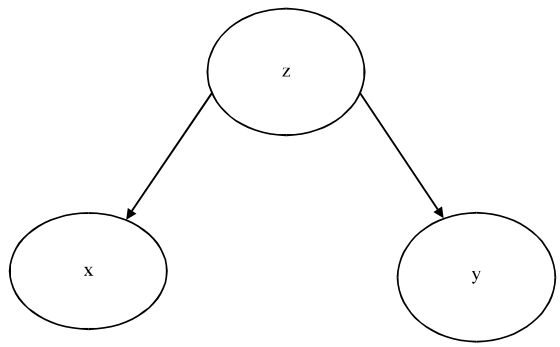

Fig. 3: Bayesian network

y with respect to the acquisition z, mathematicall P(x/y, z) = P(x/z). So in determining the value of x, y has no role and the probability of x is obtained only with respect to the value of z. Such factoring in Bayesian network represents a joint distribution of the variables. Now, the joint distributions of all the variables in Fig. 3 that have been factorized by Bayesian network are as follows:

$$P(x, y, z) = P(x/z).P(z).P(y/z) \quad (7)$$

The definition of conditional independence can also be extended to a set of variables. A set of variables $x_1, x_2, ..., x_i$ in terms of the set of variables $z_1, ..., z_n$ is independent of the set of variables, $y_1, ..., y_m$ if $P(x_1, ..., x_i/y_1, ..., y_m, z_1, ..., z_n) = p(x_1, ..., x_i/z_1, ..., z_n)$. So, in general if $X = (X_1, ..., X_n)$, then the joint probability function (joint probability distribution) for all variables of Bayesian network is as follows:

$$P(X) = \prod_{i=1}^{n} P(X_i/\text{parents}(X_i)) \quad (8)$$

The joint probability of all variables is multiplicity of the probability of each variable on the condition of the parent which is the most original and most basic assumption in Bayesian network. Usually, a Bayesian network shows the joint probability distribution with respect to a set of conditional independence assumption (which is displayed by a non-rotating arrow graph) along with a set of conditional probabilities. Each variable is shown in association with a node in the Bayesian network. There are two types of information for each variable which is obtained in terms of quality and quantity. In the qualitative phase, network arrows indicate the disabled variable (child) with respect to the cause (parent) which is conditionally independent of other causes (non-parent) on the network. It is said that x causes y if there exists a path arrow from x to y. In the quantitative phase, network arrows indicate the disabled variable (child) with respect to the cause (parent) which is conditionally independent of other causes (non-parent) on the network. It is said that x causes y if there exists a path arrow from x to y. In the quantitative phase with each node (variable), there is a probability table that shows the probability distribution of the variable according to the amount of the parents (causes) that the value of (parents $P(y_i/y_i)$) is exactly the values shown in the conditional probability table of node y_i. Sets of the conditional probability tables for all variables with complex conditional independence assumptions described in the network shows the full joint probability distribution network (Mitchell, 1997). On the other hand, the assumptions of conditional independence can be obtained directly from Bayesian network diagram. If a row of variables is considered, the variable at the end of each arrow is the cause (parent) of the variable in the arrow head. When the graph is directed and non-rotating, there is always such row and the main thing is that the lack of flash (from one node to its previous row) reflects the assumptions of conditional independence. Therefore, the stages of making Bayesian causal map are divided into two parts that is the qualitative and quantitative phases. The qualitative phase is the plan stage of Bayesian causal map. At this stage, the structure of initial causal map changes for two reasons. Therefore, the causal designed map at this stage is a plan that includes a non-rotating directional diagrams in which the nodes show the variables and the arrows show conditional independent relations.

Qualitative stage consists of 5 s teps: The first stage is in Bayesian causal map conditional independence: a network model can also be dependent map, (D-map) and Independent (I-map) Pearl dependent map, a map that defines the variables that are really linked together. On the other hand, independent puts it, the "arrow" variables that are separate and there is according to other variables, conditional independence. Both maps are maps of dependent and independent map which is called a perfect map.

The second stage: Identification of causal relationship causal maps of individual understanding of the causal relationships between variables based on reason and not to find positive for speech understanding of these relationships (Carley and Palmquist, 1992). Literature suggests that the logic of cause and effect relationships is based on two types of access due to their classification, inductive and deductive method. In Bayesian causal maps, connections should only be analogical relationships and propositions that a reasoned arguments should be removed from the map.

The third stage: Identifies direct and indirect effects on the development of Bayesian causal map in which the difference between the concepts of direct and indirect relationships is shown. This difference is important to identify the causal conditional independence in map. Direct or indirect identification of causal relationships is important for three reasons:

- To help determine the relationships between variables which can be realized with respect to the direct and indirect relationships that a variable impacts either directly or indirectly on other effects, or only through a forced variable
- If one variable affects the other only through a mediator so the first flash of the third variable is the additional complexity of the display and more
- The difference between direct and indirect causal relationships on conditional independence assumptions and probability in impact map (Nadkarni and Shenoy, 2000)

The fourth stage: Remove the rotary connector as mentioned, Bayesian causal maps are diagrams that are loaded with non-rotating structure, spinning or rotating causal relations in the map, non-rotating structure diagram causal maps Bayesian requirements are violated. Therefore, it is necessary the rotational relations in the map causal contrary to the Bayesian network to be removed. Relations are rotating for two reasons:

- Rotary interface shows errors in the map that must be corrected, for example, the direction of causality is not correct
- Rotational relationship reflects the dynamic relationships between variables at different times (Eden *et al.*, 1992)

Relations between the path of rotation can reach the correct diagnosis and deductive reasoning or direct or indirect connection to be removed. Despite these reforms in causal era, can be factors that cause the problem with a group of variables into a single variable that can cause general concept of variables eliminated. For non-rotating causal maps, there was a relationship in effect at the time to keep and the other eliminated. The non-rotating structure map for understanding and making the necessary causal maps with Bayesian networks and relationships are two-way causal Bayesian not shown in the map.

The fifth stage: Final evaluation of causal map in qualitative stage in this case to ensure the correct function to determine the correct credentials, causal map will be discussed. Remove and add stage as well as final assessment of connections that were established to achieve the main objective of this framework some measures that the purpose of the study was to measure them. Causal map completed the transformation of the map can be done on the basis of studies and theoretical foundations. For example, relationships are confirmed by two or more specialists retained and for those that they do not reach an agreement, the model is removed.

RESULTS AND DISCUSSION

Stage quantitative and determine the status of variables: In the quantitative stage, the conditional probability distribution for each variable relationship is expressed in the network. Also, it is done for each table variable distribution of conditional probabilities that is calculated according to the values of the parent (reason). Therefore, at this stage, the numerical parameters of Bayesian causal network (possibly) are determined that the following steps should be taken to achieve these values.

The value of each variable in the causal map can be classified on the basis of changes in two or more conditions such as low, medium and high and so on. Because of complex calculations in the probabilistic inference, there is always a space in such a situation. To determine the status of the network variables, all variables except for variables that are rates are converted to percent then their values are arranged from low to high and then using Eviews Software charts on each variable and testing, they set breakpoints and variable breakpoints based on their status is determined. There are two variables in Bayesian network that has a single point of failure and those three conditions which have two points of failure. After determining the distribution of probability associated with each of the states with respect to the variables of conditional probabilities (variables for use with at least one reason) using Netica Software. For the status of each variable on the network there is a table of probabilities and the probabilities of the prior probability distribution variables, without any foreign interference in the network which is expressed as a percentage of probability in the network. Figure 4 shows a map of the causal Bayesian variable CO_2 emission growth and a number of other variables that are associated with CO_2 emissions as indicated by the connectors. It is said that according to the likelihood that high CO_2 emissions growth rate is 50.7 and 49.3%, it is less likely. The numbers specified in the table below shows the standard deviation of each variable, respectively, from right to left and mean variables as well.

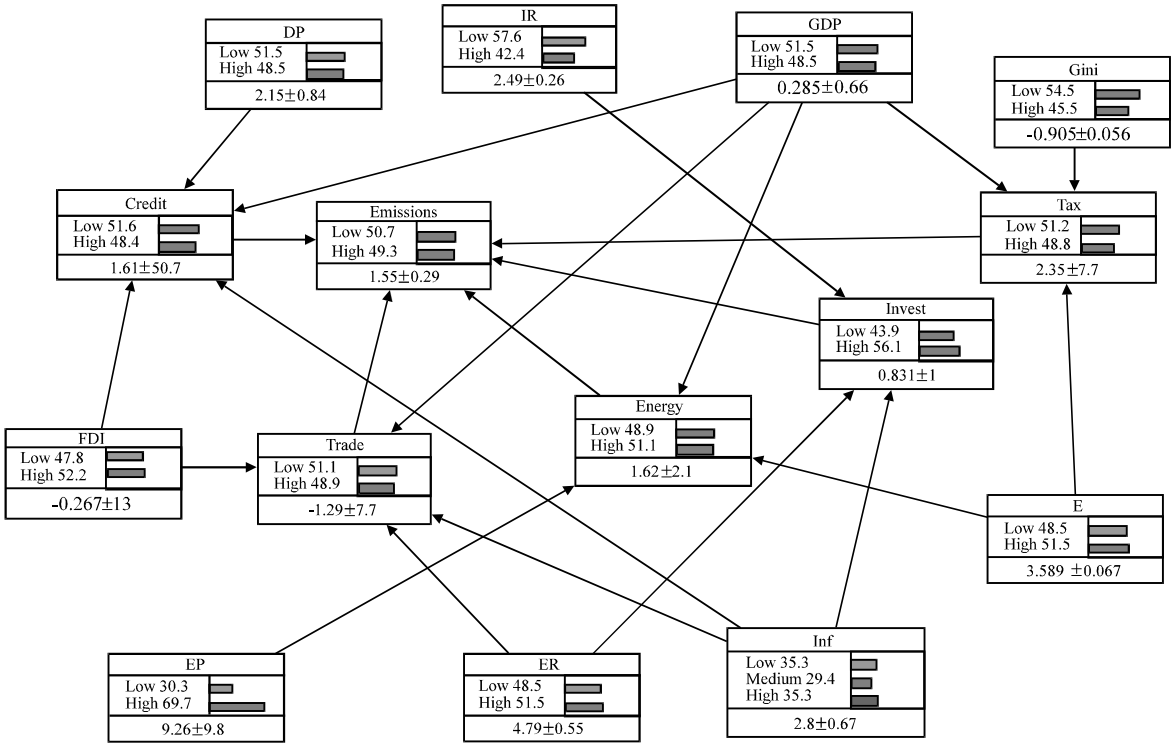

Fig. 4: Bayesian causal map along with probability distribution of the research variables

The sensitivity analysis includes testing the probability of the variables under various scenarios and then to relate the status of these variables is subject in this way, every time a state variable while the other variables are kept constant changes and the effect of these changes is to investigate the possibility of changing the situation and how the impact will be seen and understood. How to influence the probability of a variable is the target variable that after the possibility of changing one of the variables, it is observed that states probabilities target variable has changed. Now, each of the situations most likely indicates the desired change. Also use of one-way sensitivity analysis, it could be the target variable sensitivity to changes in variables and the severity of the impact of changes in the map data on the map of the target variable measured. One-way sensitivity analysis shows the impact of changes in variables of Bayesian causal map on CO_2 emissions and also reduces the variance of each variable that reflects the degree of sensitivity or influences the probability distribution variables on CO_2 emissions and the lowest impact on CO_2 emissions.

According to Table 1, it can be seen that the most effective Trade and Investment have the least effect on CO_2 emissions. To assess the impacts of economic variables on CO_2 emissions in order to achieve its goal of reducing CO_2 emissions, stage inference using sensitivity analysis for variables, trade, private sector credit, tax, energy and private sector investment business will be handled. In the five scenarios, the effect of these variables on CO_2 emissions is shown in the test.

Table 1: The degree of the impact of changes in business variables in Bayesian causal map on CO_2 emissions

Variables	Variance reduction
Business	58.78
Private sector credit	32.48
Tax	4.853
Energy	4.214
Investment	1.042

First scenario: Since, the important reason of global market businesses is economic growth in many countries, these countries accelerate their commodity production and trade which in turn have caused environmental problems. Environmental effects of international trade in the past decade have been the fundamental questions of research developed in several different countries. While trade between the countries increased consumer welfare, the emissions are leading the charge of the business community. After the change appears likely to increase the rate of growth of trade (Fig. 5) CO_2 emissions growth rate is also likely to post 55.3%.

Second scenario: Financial sector development and private sector credit could facilitate further investment with low cost which includes investing in environmental

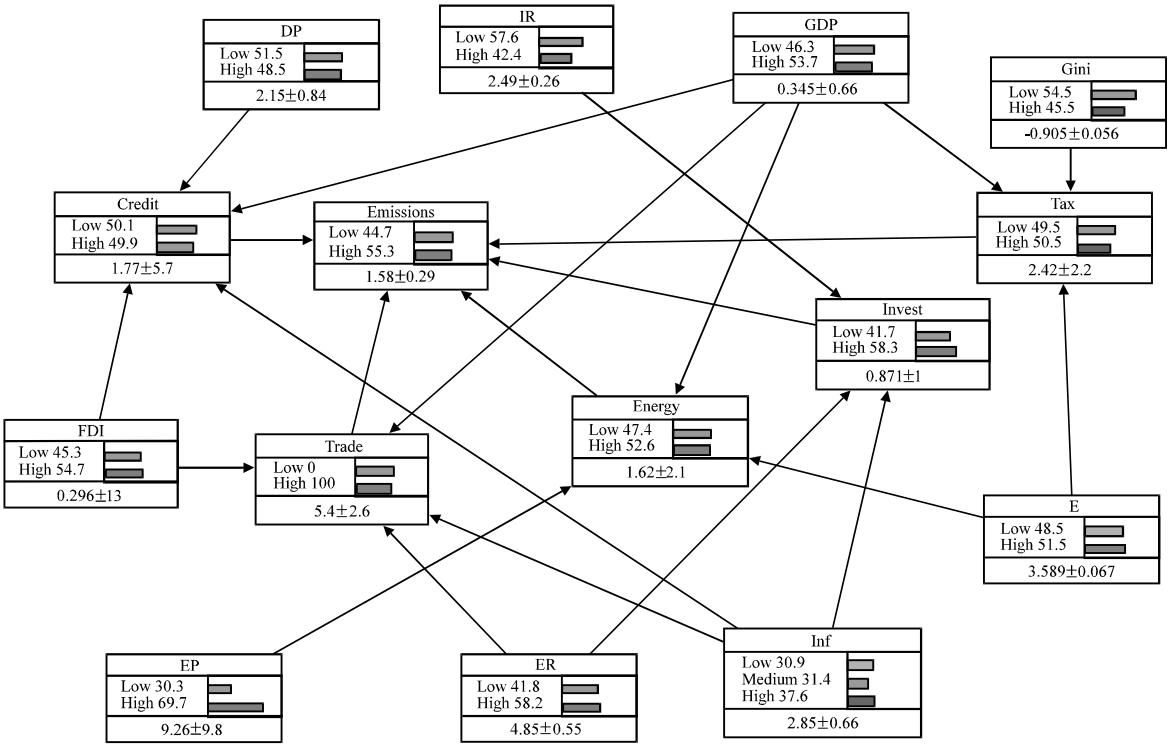

Fig. 5: The first scenario: increasing the trade

projects as well. Financial development and clean technology companies access to that release less carbon dioxide and increase the gross domestic product and financial regulation and investment in favor of promoting the quality of the environment. After validating the possibility of private high growth rate (Fig. 6) as one of the economic indicators, we see that the situation is much more likely to emit CO_2. So, it can be concluded that with private validating increasing the growth rate, rate of CO_2 emissions are likely to rise 55.3%.

The third scenario: Tax is another intended variable. After changing the probability of tax (Fig. 7) as one of the economic indicators, it is observed that most of CO_2 emission is more likely to happen. So, it can be concluded that with an increase in the growth rate of tax, the rate of CO_2 emission is also increased with the probability of 54.2.

The fourth scenario: Energy can be considered as one of the essential factors in economic development in any society. Increasing population growth, energy and consequently the growth of energy consumption, especially of fossil energy increases environmental problems. In general, trend towards sustainable development, according to environmental damage caused by the energy sector is essential. There is so possibility of changing the status of variable high energy growth rates (Fig. 8), there is that lot of CO_2 emissions more likely. By increasing the growth rate of energy consumption, CO_2 emissions rate is also likely to rise 55%. The existence of relationship between energy consumption and CO_2 is expected in theory.

The fifth scenario: The impact of investment on environmental quality, it is especially different in developing countries. Some people say due to the impact of on economic growth, investment could affect the environmental quality of the environment and environmental situation becomes worse because it is the left half of the Kuznets curve. Therefore, with the accumulation of capital, in the early stages of development, pollution will increase too and by growing per capita income and the movement of economy from industry to service sector, using human resources instead of capital, pollution will be reduced. As Table 1 shows, investment has the least impact on CO_2 emissions on Bayesian causal map. After the change in the probability of increasing the growth rate of private investment as it is observed in Fig. 9, the growth rate of CO_2 emissions is also increased with posterior probability of 51.9.

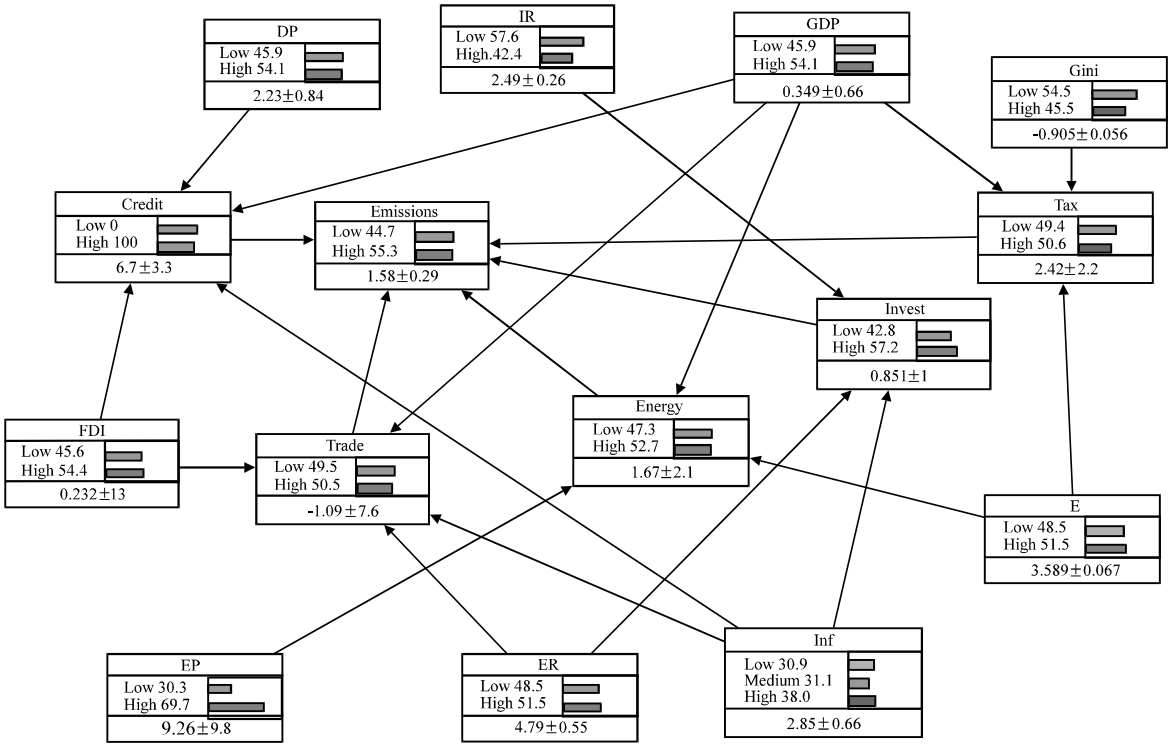

Fig. 6: The second scenario: an increase in private sector credit

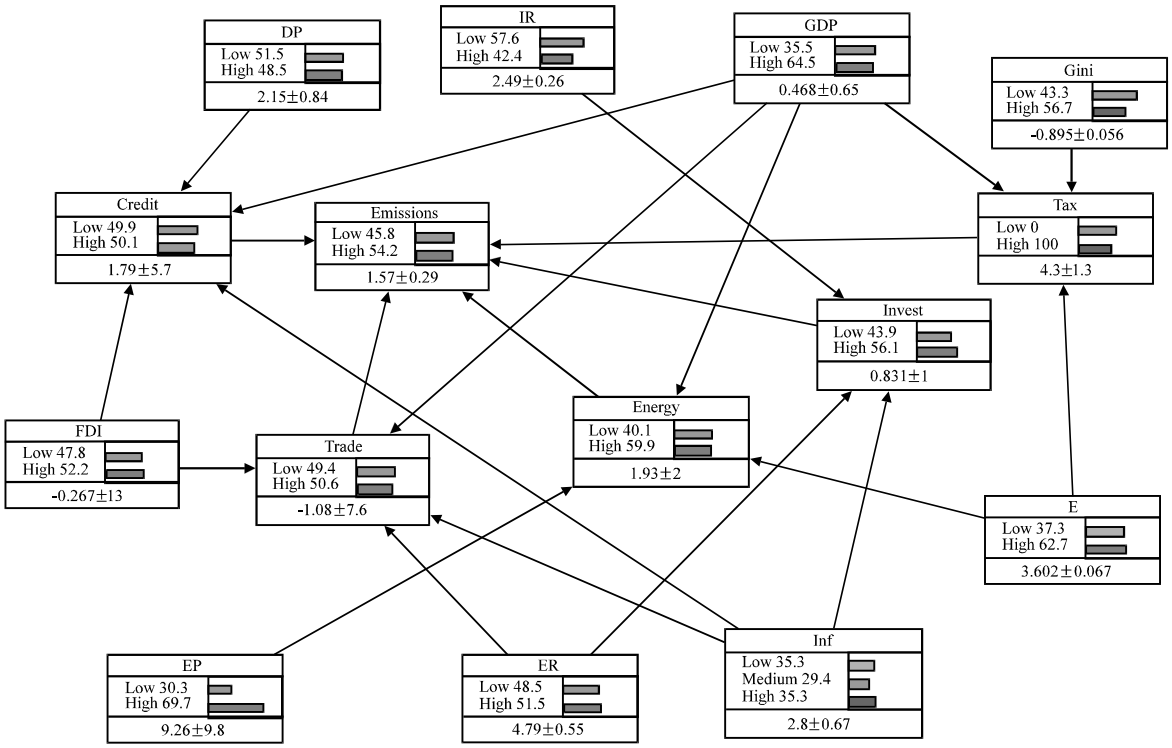

Fig. 7: The third scenario: increase taxes

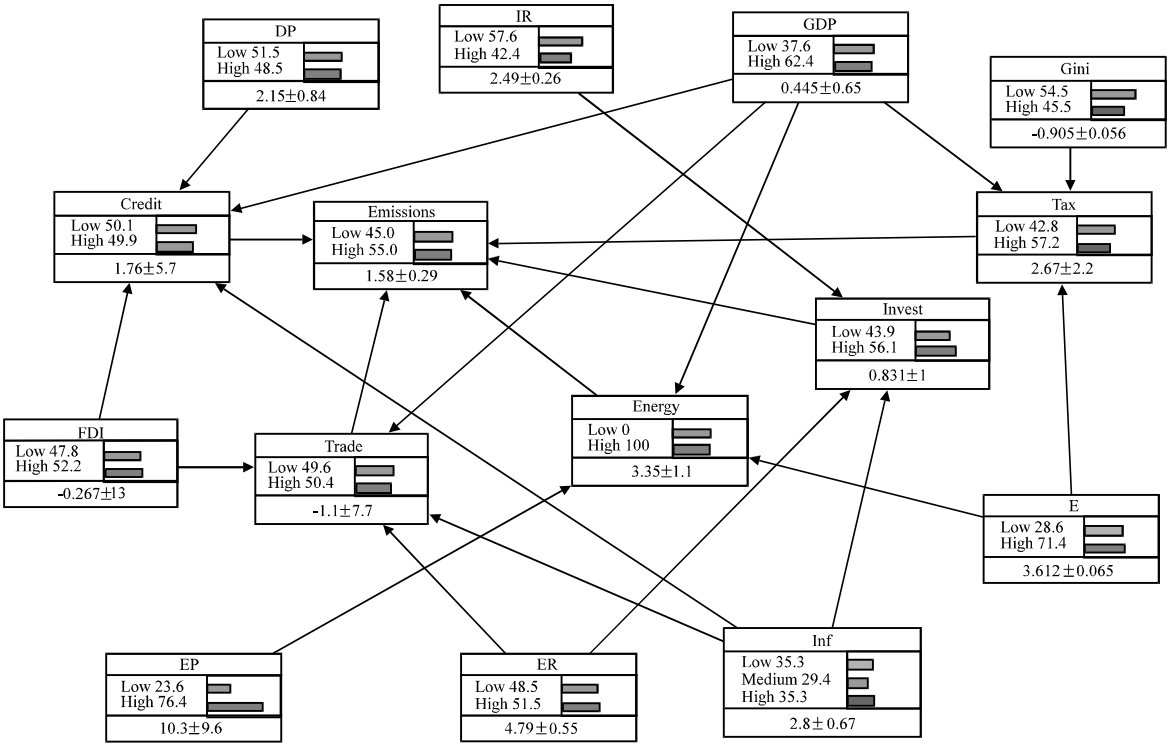

Fig. 8: The fourth scenario: an increase in energy consumption

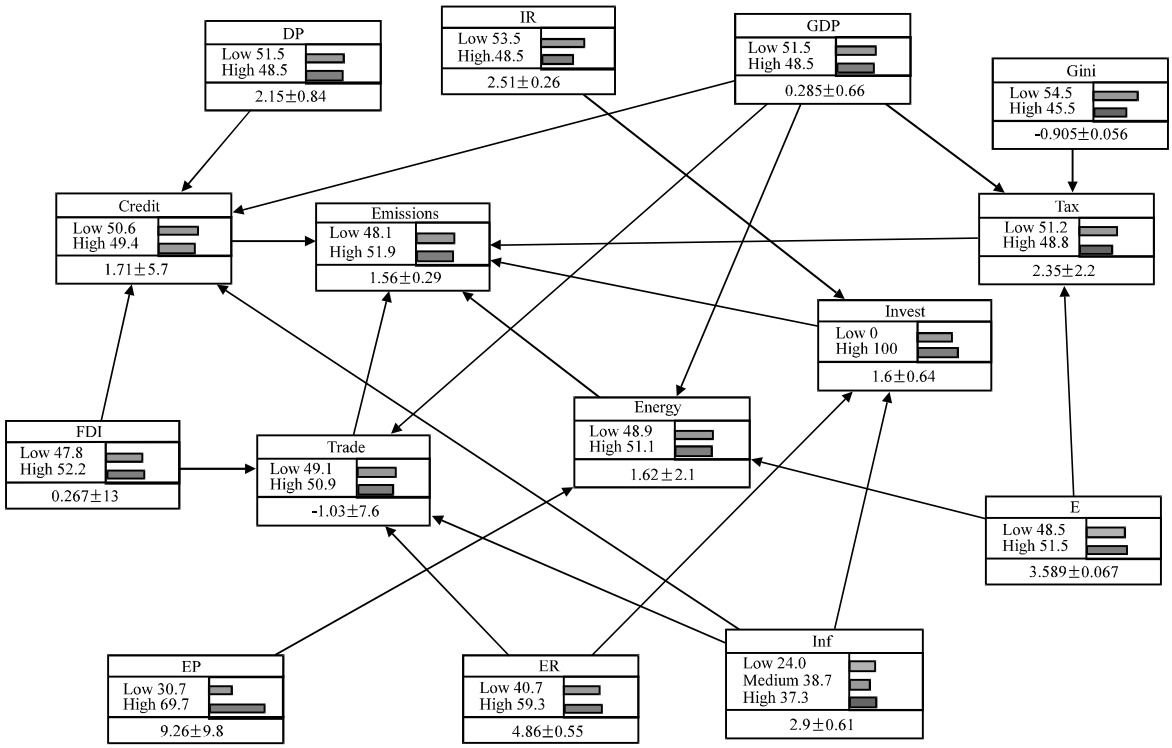

Fig. 9: Scenario five: an increase in private sector investment

Table 2: The variable pre and post CO_2 emissions in different scenarios

Pre and post probability of CO_2 emissions in different scenarios	Growth CO_2 emissions	
	High	Low
Pre probability	50.7	49.3
Post probability in first scenario	55.3	44.7
Post probability in second scenario	55.3	44.7
Post probability in third scenario	54.2	45.8
Post probability in fourth scenario	55.0	45.0
Post probability in fifth scenario	51.9	48.1

Results show the four scenarios (Table 2) that after situation is likely to change very much CO_2 emissions are also more likely to state variables.

CONCLUSION

Despite the augmentation of important factors such as labor and capital, one of the main challenges of economic growth is the emergence of an environment where entrepreneurs and economic agents ranging from enterprises and investors are active in the business. In the current situation of the world, a growing consensus has been formed on the efficient functioning of the increased share of private sector in economy. Economists focus on the issue of privatization and reduced government intervention because the widespread presence of the state in all economic spheres fades the motivation of entrepreneurs and private sector in economy. So to convert the state economy to non-state economy the strategy of improving the business environment can be used rather than privatization strategy. Most economic activities influence the environment to some extent. Sometimes, economic changes such as changes in technology, consumption patterns and the level of investment, international trade and macroeconomic policies affect the environment. Today, the importance of the environment is stressed by all. Although, the quality of the environment may not be stated on monetary value in developed countries, the quality of the environment is an important factor in market transactions. In developing countries, there is the idea that environmental control is a luxury item; however, it may not be the case for other countries. Environmental issues are more acute in developing countries. Sometimes the survival and continuation of the lives of thousands of poor people depends on the environment. Therefore, in this study, in order to analyze the role of business indicators including energy, private sector credit, private sector investment, business and tax in environmental changes, Bayesian Causal Map (BCM) was used in five different scenarios. The method is appropriate for modeling in uncertain conditions and is a useful guide to identify a policy that has been done by government officials. Especially when information and data are rare, BCM shows the maps more descriptive than other models such as regression or structural equation and is a more useful tool for decision-making. The impact of changes in economic variables on the rate of growth of CO_2 emissions was done with the use of one-way sensitivity analysis and it was found that among from the four indicators, business, private credit, taxes and then energy consumption and ultimately private sector investment had the highest impact on CO_2 emissions. Also, the results of the five scenarios show that after the change in the probability conditions, CO_2 emission is more likely to happen.

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