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# Validation of Networking Approach in Environmental Policy in IRAN to Decrease Environmental Pollution by Factor Analysis Method

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**Abstract:** This study attempts to validate the proposed model for environmental policy in IRAN to decrease environmental pollution by implementing network approach. This descriptive-analytical and cross-sectional study was carried out by survey approach. The statistical population of the study consisted of experts and policymakers in the field of environment who had environmental planning and policymaking experience at the national and regional level. In this research, Structural Equation Method (SEM) was used for analysis. The results presented an acceptable and excellent fitness for indices of TLI and CFI (0.93). On the other hand, the obtained results for GFI index indicate the relative fitness for the model (0.86). Besides, the obtained results for PNFI and PGFI indices (0.78 and 0.84, respectively) revealed the acceptability of the model. Also, the registered value for the RMSEA index (0.073) presented the acceptability of the model. Finally, the results of the factor analysis revealed that this model has enough fitness and total numbers and parameters are significant which confirm the acceptability and excellent fitness of the model. In sum, based on factor loading, it is clear that three main factors related to the data of the network-based environmental policy system, the "intervening conditions" with the factor loading of 0.96 were the best predictors. Among 17 measured items, the component of "national maturity" had the highest factor loading, and the element of "Eleventh government Environmental Policies" had the lowest factor loading.

**Keywords**: Environmental Policy, Environmental Pollution, Network Approach, Validation

## 1. Introduction

Nowadays, Iran is encountered with many environmental issues. It is estimated that the annual damage of soil erosion and degradation (in 2011) is 3,500 billion rials (Matoofi and Duncan 2017). Iran has considered as one of the top Asian countries with a high rate of soil loss that the cost of soil erosion equals 14% of national gross income (Yousefi 2015). The replaceable resources of water in Iran country are decreased from 130 billion to 120 billion $m^2$, and in the future, this procedure will be increased (Babaei 2018). Per capita of water resources in Iran is 1704 $m^2$ ($112^{th}$ position in all over the world). Water exploitation from underground resources in Iran country was about 11 billion $m^2$ in 2006, which ultimately results in land subsidence (Ganjavian 2018). It was predicted that 297 plains of 600 plains in Iran have dried up, and more than 90% of Iran country area is encountered with desertification (DOE 2018). About 1.5 million hectares of western oak forests in the Zagros plain were destroyed by drought disaster; meanwhile, northern forests of Iran have worse conditions (Bahmanpour 2015; Ganjavian 2018). Recently, World Bank has estimated that the annual damages of air pollution in Iran is about 14420 billion rials which include 1.6 percent of gross inside production, and the annual death rate related to urban air pollution is 640 million dollars that its value includes 0.57 % of gross inside production (Bahmanpour 2015). Based on these estimations, the annual damages of air pollution in Iran will be predicted about 16 billion until 2019 (DOE. 2018). Generally, Iran has the 80th position among other countries in the world at the environmental rank (EPI. 2018). The position of Iran is placed in the middle of rank that it is not a suitable place (Figure 1).

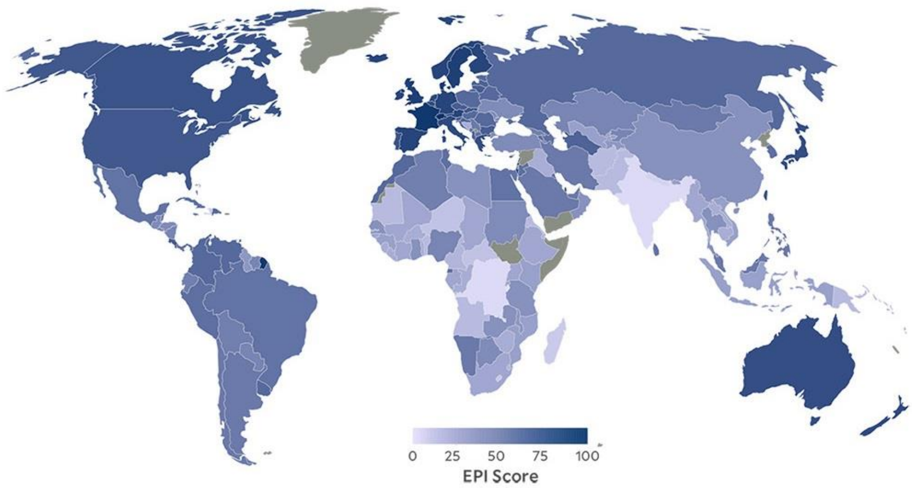


**Figure 1- Position of Iran in the Environmental Performance Index (EPI) for 2018 (EPI, 2018)**

In fact, the main environmental problem in Iran country is the lack of implementation of environmental policies (Momivand et al. 2018). Recently, numerous policies are submitted by organizations, which are active in environmental fields. The results indicated that policies have not been implemented entirely or are abandoned in the middle of implementation (Ganjavian 2018; Momivand et al. 2018). The main reason is the failure of policymaking, or the implementation of macro-environmental policies in Iran is the lack of adopting a comprehensive and united approach, respecting to all the benefits of stakeholders. Nowadays, several organizations are involved in the environmental issues of Iran, although the foremost pioneer of the environment is the environmental protection organization (henceforth, EPA). Experiences have shown that the protection of the environment due to cumbersome rules, administrative bureaucracy, and the broad scope of the environment is not only possible through a single organization. However, a set of specialized organizations as well as non-governmental organizations play a dominant role in accelerating the achievement of environmental goals, reducing pollution, and repairing environmental damage (Bahmanpour et al. 2017). Although there are different theoretical approaches to the successful implementation of policies, presenting native modeling seems to be very applicable.

Therefore, the purpose of this study is the validation of the proposed model at the environmental policy in Iran country to reduce environmental pollution by network approach. Recently, the concept of the network has been used as a form of organization, as a metaphor as well as an analytical tool. The term network was first coined in the academic literature by Radcliffe-Brown in 1940, and sociologists recognized its importance as an aspect of social life (Korir et al. 2017). The network provides a useful model for examining daily interactions and thinking about community dynamics. The network can be considered a complex system that carries out storing, processing, and distributing information. The term network can be used as a coherent configuration of different organizations, but it is helpful to know what distinguishes networks from other forms of organization. The essential feature of the network is the presence of horizontal spider web links between its components, which distinguishes it from other bureaucratic structures (Gilchrist 2009).

The term network has been used in government management literature in three ways:

- As a metaphor or concept of organizing
- As cognitive methods and paradigms
- As an approach or tool for understanding the public service provision (Isett et al. 2011).

Individuals can form clusters that carry out specific tasks and have relative independence through the contribution of networks (Vesterager et al. 2016). This form of organization is called flexible specialization, which represents a state of very complex systems. In this organization, innovation and creativity are considered as an advantage (Gilchrist 2009). Therefore, considering different stakeholders and their participation through network governance have been introduced as an appropriate and alternative approach (Chaiton et al. 2013). Networks are interdependent structures of stakeholders that are interlinked with mutual trust and shared norms, and through this communication can make adaptive decisions about achieving specific goals (Whitall 2007). Besides, it affects the dynamics of policy and its consequences broadly (Henry et al. 2011). Policy networks are tools for modern political decision-making. Through using networks, the classical constraints between the different functions of the public and private actors have disappeared mainly (Aslipoor et al. 2014). The networked approach to public policy has juxtaposed different formal and informal relationships of different actors. Therefore, authority is distributed in modern political systems, because technical, financial, and political resources are distributed throughout society and do not belong to a particular individual or group. Three main aspects of these networks are conflict, collaboration, and power relations (Fischer 1990).

In recent years, networks have become one of the essential governance mechanisms. Cases such as the integration of Europe show the effort to integrate different actors and solve problems that cannot be resolved by formal organizational mechanisms (Kamli 2010; Kostka 2014).

Some of the benefits of network policy are shown in Figure 2.

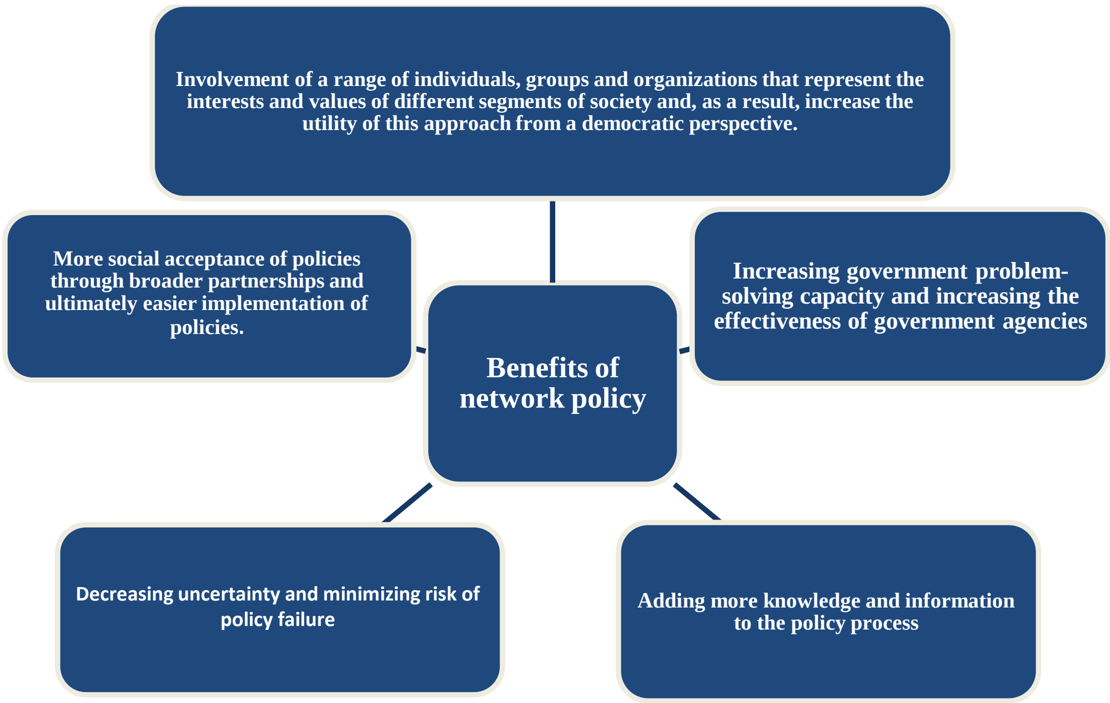


**Figure 2- Benefits of network policy**
**(**Drawing by authors based on research literature**)**

The essential feature of the network is the existence of horizontal spider web links between its components that distinguish it from other bureaucratic structures (Gilchrist 2009). Networks facilitate social interactions and reduce transaction costs (Isett et al. 2011; Fischer, 1990).

## 2. Methodology

This study is descriptive-analytical and cross-sectional research that was conducted by a survey approach. Then, data were collected and categorized by using theoretical background and research background. The data were coded based on the purposes and questions of the study. Then a conceptual model of research was designed. Accordingly, the network-based environmental policy system consists of 3 inputs and 17 mediators (Figure 3).

To confirm the face validity of the questionnaire, the comments of experts and professors were used. Given the uniqueness of the subject, the statistical population of the research was very limited and small.

The statistical population of the study included environmental experts and policymakers in Iran country who had precedence over others in term of environmental planning and policy at the national and regional level. Based on survey research, the population number was 33. The statistical sample was selected based on the available sample (n = 15), because some of them were not willing to participate and some were out of the country and out of reach. The initial model of the research was investigated and tested using Structural Equation Method (SEM). A researcher-made questionnaire was used to answer the research questions.

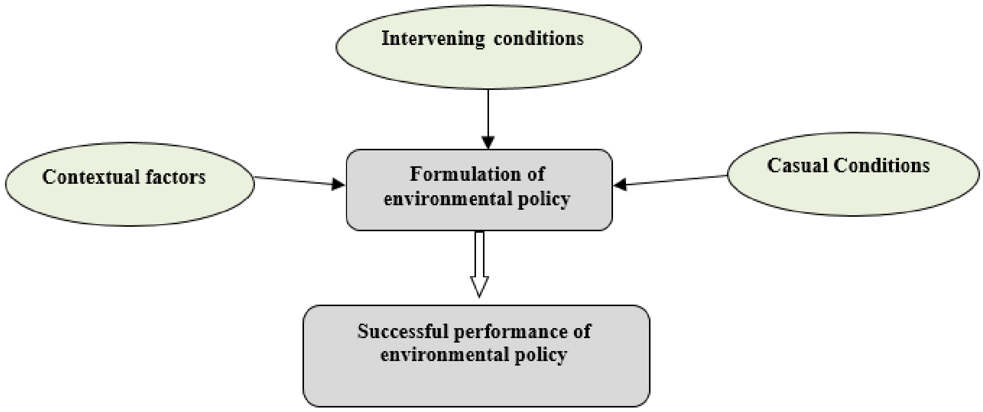


**Figure 3- Conceptual model of research**

The main research questions of this study were:

- What is the prioritization (weight and importance) of the inputs in the network-based environmental policy (intervening conditions)?
- What is the prioritization of network-based environmental policy system data (contextual factors)?
- What is the prioritization of network-based environmental policy system data (casual conditions)?
- Which of the environmental policy inputs of the country would play the most crucial role in managing and reducing environmental pollution?

To confirm the reliability (internal consistency) of the questionnaire, Cronbach's alpha method was used. The total alpha of the questionnaire was 0.876. In addition, Cronbach's alpha is comprised of intervening conditions (0.751), contextual factors (0.793), and casual conditions (0.835). The internal consistency of the components of the current questionnaire was acceptable, and the internal consistency of the total questionnaire was acceptable. The results of the Cronbach's alpha coefficient are presented in Table 1.

**Table 1- Cronbach's alpha coefficient results to determine the internal consistency of the questionnaire**

| Row | Subscales | Item numbers | Cronbach's alpha |
|---|---|---|---|
| 1 | Intervening conditions | 5 | 0.751 |
| 2 | Contextual factors | 6 | 0.793 |
| 3 | Casual conditions | 6 | 0.835 |

## 3. Results

The research results are presented in two sections as follows.

### A. Fitting the factor analysis model and determining the validity of the questionnaire

Confirmatory factor analysis, according to the structural equation modeling, was used to confirm the construct validity of the questionnaire. The fitness indices of this model are listed in Table 2.

**Table 2- Values of the fitting indices of the confirmatory factor analysis model**

| Fit indices | Observed values | Standard values |
|---|---|---|

| | | |
|---|---|---|
| Chi-square | 1341/86 | |
| Degree of freedom (df) | 2.2 | Between 2 and 5 |
| Significance level (p) | 0.001 | |
| The ratio of the chi square to the degree of freedom | 2.9 | Less than 3 |
| Goodness of fit index (GFI) | 0.86 | More than 0.5 |
| Tucker-Lewis index or Non-Normed Fit Index (TLI / NNFI) | 0.93 | Between 0 and 1 |
| Bentler Comparison Fit Index (CFI) | 0.93 | Between0 and 1 |
| Root ***Mean*** Square Error of Approximation (RMSEA) | 0.073 | Less than 0.08 |
| Predictive Good Fit Index (PGFI) | 0.78 | More than 0.5 |
| Permanent Normative Fit Index (PNFI) | 0.84 | More than 0.5 |

Based on the obtained results in Table 2, and by considering three indices of TLI, CFI and GFI with zero to one ranges, values more than 0.85 indicate **relative fitness** of the model, values more than 0.90 indicate **excellent and acceptable fitness** of the model and values more than 0.95 are the reason for the **excellent fitness** of the model.
Also, in terms of PNFI and PGFI indices, values more than 0.50 are acceptable. In terms of the index of RMSEA, values less than 0.08 indicate an acceptable and reasonable model, and less than 0.05 indicate a good model. In addition, the confidence interval can also be calculated for this index. The ideal state is that the lower bound of confidence interval should be near to zero, and its upper bound should not be more than 0.1. Furthermore, the larger the factor loading and the closer to one, the better the independent variable could be explained by the observed variable. Under the condition that the factor loading is less than 0.3, the relation would be **weak,** which could be ignored. Under the condition that a factor loading is between 0.3 and 0.6, it would be acceptable, and when factor loading is more significant than 0.6, it would be highly favorable. In addition, the t value in all questions was higher than 1.96, indicating a significant relationship between the questions and their related components, so that all observed variables (questions) were able to predict their components (Tables 3 to 6).

## (B) Description of the main elements of the main inputs of the network-approach- based environmental policy system

In this section, three main factors (intervening conditions, contextual factors, and casual conditions) that are the main inputs of the network-approach- based environmental policy system are investigated and analyzed.

### 3.1. Intervening conditions

Using confirmatory factor analysis tests and emphasizing the factor loadings of each item related to “intervening conditions” of the inputs of the network-based environmental policy system, their priority in terms of degree of relevance is represented in Table 3.

**Table 3- Importance of network-based environmental policy inputs (intervening conditions)**

| Row | Inputs intervening conditions | Mean | Factor loading | t index | p | Significance level |
|---|---|---|---|---|---|---|
| 1 | Vision Document (Horizon 1404) | 13.00 | 0.60 | 8.44 | 0.0010 | 2 |
| 2 | Article 50 of the Constitution | 13.20 | 0.64 | 8.71 | 0.0010 | 1 |
| 3 | Environmental Communication Policies | 13.00 | 0.47 | 6.65 | 0.0010 | 3 |
| 4 | Eleventh Government Environmental Policies | 7.60 | 0.40 | 5.68 | 0.0010 | 5 |
| 5 | Environmental provisions in the Sixth Development Plan | 8.60 | 0.41 | 5.79 | 0.0010 | 4 |

### 3.2. Contextual factors

Using confirmatory factor analysis tests and emphasizing the factor loadings of each item related to “contextual factors” of the inputs of the network-based environmental policy system, their priority in terms of degree of relevance is represented in Table 4.

**Table 4- Importance of Network-Based Environmental Policy System Data**

| Row | Inputs intervening conditions | Mean | Factor loading | t index | p | Significance level |
|---|---|---|---|---|---|---|
| 1 | Technology and environmental facilities | 10.20 | 0.61 | 7.45 | 0.001 | 3 |
| 2 | Environmental power and type of ecosystems and their quality and quantity | 12.00 | 0.65 | 8.49 | 0.001 | 2 |
| 3 | General environmental value system | 8.20 | 0.55 | 7.47 | 0.001 | 5 |
| 4 | Environmental value system in Islam | 8.40 | 0.57 | 7.50 | 0.001 | 4 |
| 5 | National Maturity | 12.80 | 0.74 | 9.31 | 0.001 | 1 |
| 6 | Benefit from financial resources | 8.00 | 0.53 | 6.95 | 0.001 | 6 |

### 3.3. Casual conditions

Using confirmatory factor analysis tests and emphasizing the factor loadings of each item related to “casual conditions” of the inputs of the network-based environmental policy system, their priority in terms of degree of relevance is provided in Table 5.

**Table 5- Importance of Network-Based Environmental Policy System Inputs (casual conditions)**

| Row | Inputs intervening conditions | Mean | Factor loading | t index | p | Significance level |
|---|---|---|---|---|---|---|
| 1 | Ultra vires actors | 11.40 | 0.69 | 6.96 | 0.001 | 1 |
| 2 | Judicial actors | 10.20 | 0.54 | 8.53 | 0.001 | 3 |
| 3 | Super-institutional actors | 11.20 | 0.57 | 8.90 | 0.001 | 2 |
| 4 | Global environment actors | 9.80 | 0.54 | 8.46 | 0.001 | 4 |
| 5 | Legislative actors | 9.40 | 0.51 | 8.02 | 0.001 | 5 |
| 6 | Executive actors | 8.80 | 0.47 | 5.27 | 0.001 | 6 |

The results of the second-order factor analysis are presented in Table 6.

**Table 6- Factor load and t-index of the main inputs**

| Row | Bidding factor | Factor loading | t index |
|---|---|---|---|
| 1 | Intervening conditions | 0.96 | 9.96 |
| 2 | Contextual factors | 0.84 | 14.37 |
| 3 | casual conditions | 0.81 | 8.99 |

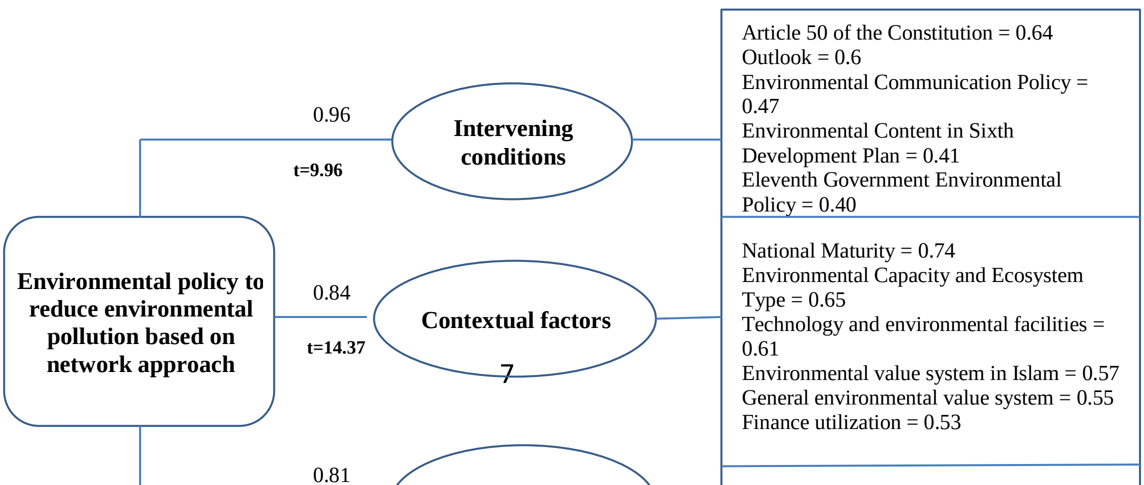

**Figure 4- Final research model based on factor loadings of inputs and related components**

## 4. Discussion

There is no general agreement on acceptable values of the $\chi2$ /df index. Some scholars ascertain that values less than 3 are representative of acceptable models while others consider values between 2 to 5 to be representative of reasonable and appropriate models (Deeb 2014). Here, the model is of acceptable fit since this value is less than 3.

The value of TLI and CFI indices (0.93) is representative of good and acceptable fit. On the other hand, the achieved value of GFI index (0.86) is representative of the relative fitness of the model. Also, the achieved values of PNFI and PGFI indices (0.78 and 0.84, respectively) indicate that the model is acceptable. The achieved value of the RMSEA index (0.073) also indicates that the model is acceptable. Finally, the results of factor analysis showed that this model was fit and all the numbers and parameters were significant. These facts confirm the acceptability and excellent fitness the model.

In terms of investigating and analyzing the main data of the network-approach-based environmental policy in the country, and answering the research questions, the contributions of this study are as follows:

With respect to the intervening conditions, the component of “article 50 of the constitution” with a factor loading of 0.64 and the t index of 8.71 is the best predictor.

With respect to the contextual factors, the component of “national maturity” with a factor loading of 0.74 and the t index of 9.31 is the best predictor.

With respect to casual conditions, the component of “ultra vires actors” with a factor loading of 0.69 and the t (t) index of 6.96 is the best predictor.

Overall, considering the factor loading values, it was found that among the three main factors related to the inputs of the network-based environmental policy, the “intervening conditions” with the factor loading of 0.96 was the best predictor.

Out of 17 measured components, the component of “national maturity” had the highest factor and the component of "Eleventh State Environmental Policies" had the lowest factor.

## 5. Conclusion

The overall conclusion of this study is that the most effective input to develop an environmental policy with the aim of reducing environmental pollution through adopting a network approach system is the intervening conditions that require specific attention. On the other hand, contextual factors and casual conditions are in the second and third order with slight differences.

It should be noted that the generalizability of the results to other countries should be considered. However, the method used in this study is applicable in all countries.

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