

PAPER • OPEN ACCESS

Evolution of the Public's Attitude toward NIMBY Incidents based on Opinion Dynamics Theory: An Agent-based Model

To cite this article: Huimin Liu *et al* 2021 *J. Phys.: Conf. Ser.* **1746** 012032

View the [article online](#) for updates and enhancements.

You may also like

- [Values in the backyard: the relationship between people's values and their evaluations of a real, nearby energy project](#)
Goda Perlaviciute, Robert Görsch, Marieke Timmerman et al.
- [NIMBY, YIMBY, or something else? Geographies of public perceptions of shale gas development in the Marcellus Shale](#)
Chad Zanocco, Hilary Boudet, Christopher E Clarke et al.
- [Research on Risk Acceptance of Urban NIMBY Facilities Based on Structural Equation Model-Taking Tianchang City as an Example](#)
Li Luo and Yunqing Wu



ECS
The
Electrochemical
Society
Advancing solid state &
electrochemical science & technology

DISCOVER
how sustainability
intersects with
electrochemistry & solid
state science research

Evolution of the Public's Attitude toward NIMBY Incidents based on Opinion Dynamics Theory: An Agent-based Model

Huimin Liu¹, Shuang Song¹, Shuya Hu¹ and Tong Wang^{1,*}

¹School of Management and Engineering, Nanjing University, Jiangsu Province, China

*Corresponding author email: mg1915032@smail.nju.edu.cn

Abstract. NIMBY (Not in My Back Yard) incidents often affect the progress of infrastructure construction and sometime may cause social instability. The public's NIMBY attitude is affected by various factors, which also lead to the development of NIMBY incidents. To explore the influence of the public's internal composition and external environment on the evolution of the public's NIMBY attitude, a bounded trust model of the public's continuous viewpoint to a NIMBY event is constructed in this study based on opinion dynamics theory. The evolution process of the public's attitude in different internal and external situations is also simulated. Among the public, the evolution of the individual public's NIMBY attitude is affected by the individual communication in their network of relations. According to their degree of influence, the public can be divided into three categories: ordinary individuals, opinion leaders, and diehards. In external environment, the public's attitude is influenced by the timeliness and compensation degree of the government's response to a NIMBY incident and the information transmitted by the media. The simulation results show that during the public's opinion exchange, opinion leaders and diehards in a group usually have a strong impact on the evolution of the public's NIMBY opinion. Moreover, the government's environmental compensation can only alleviate the NIMBY conflict temporarily. The findings also indicate that the government and the media should maintain the authenticity of information disclosure, and public participation and multiparty cooperation mechanism should also be encouraged.

1. Introduction

Given the recent awakening of public democratic awareness and the improvement of their social participation, NIMBY conflicts have occurred frequently. On the one hand, NIMBY incidents hinder infrastructure construction and thus bring serious harm to the public interest [1, 2]. On the other hand, NIMBY incidents cause conflicts among public, enterprises, and government and further lead to class conflicts and even regional riots [3]. During NIMBY incidents, the public's attitude usually changes as the incidents develop [4]. Understanding the evolution trend and the factors influencing the public's attitude is needed to intervene in time, which can effectively control NIMBY conflicts.

The evolution of the public's NIMBY attitude is mainly affected by internal and external environments. Among the public, the evolution of the individual public's NIMBY attitude is affected by the individual communication in their network of relations. In external environment, the public's attitude is influenced by the timeliness and compensation degree of the government's response to a NIMBY incident. Information transmitted by the media also shapes the public's judgment and opinions on a NIMBY incident [5]. Therefore, the main research questions in this study are as follows: What is the general trend of the evolution of the public's attitudes toward NIMBY conflicts? How do public's internal structure and external environment influence the evolution of the public's NIMBY attitude? What



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

strategies should the government and the media adopt to effectively alleviate the public's negative attitude?

The existing research on the public's attitude toward public events focuses on the analysis of public opinion dissemination, mostly covering the government, the media, the event itself, and the public. Chen et al. studied a collaborative filtering algorithm based on users and analyzed the trend prediction principle of Internet public opinions on the basis of collaborative filtering [6], which can predict the development trend of Internet public opinions effectively. Yong et al. studied the evolution of herd behavior in public opinion communication and analyzed the general rules of herd behaviors using the evolution model of herd behavior in public opinion communication [7]. Peng et al. modeled and simulated the group behaviors of Internet users and the real environment based on ABM [8], analyzed the evolution path of Internet public opinion in emergency management, and discovered the relationship between the evolution of Internet user group behaviors and the public opinion of emergencies.

The evolution of the public's NIMBY attitude is affected by complex and dynamic factors, including the public's internal opinion exchange, the behaviours of external government and the media. Despite the importance of this issue, limited systematic simulation studies have seldom been conducted on the evolution of the public's attitudes in NIMBY conflicts. In order to investigate the complex evolutionary mechanism of public opinions, this study constructs a bounded trust model of the public continuous opinions of a NIMBY incident according to the theory of opinion dynamics which enables to explore the evolution of a group's opinions under the influence of external information and exchange rules. This study also uses a computational experiment to simulate and analyze the exchange mechanism and evolution process of the public's NIMBY opinion under different scenarios of government and media involvement, thereby to provide policy implications for government to improve its ability to avoid NIMBY conflicts.

2. Agent-based Modelling

ABM can compensate for the lack of complex simulation and comprehensive human control in physical experiments and restore the complex dynamic characteristics and operation rules of social systems. Therefore, an ABM model of the public's NIMBY attitudes is constructed by modifying the classical continuous HK model of opinion dynamics, and in combination with the actual situation of NIMBY in this study.

2.1 Evolution of the Public's Attitudes

The model discusses the influence of the public group structure, the amount of government compensation and the authenticity degree of the media coverage on the evolution of the public's NIMBY attitude to provide somehow a prediction on the trend and an insight on the internal mechanism of the public's attitude evolution.

As shown from figure 1, the public can be divided into three types of agents, namely, ordinary individuals, opinion leaders, and diehards. In addition to an external factor (i.e., the distance to adjacent facilities) [9], an internal factor (i.e., the subjective perception of the public individuals on the adjacent facilities) endows the public with varying NIMBY attitudes [10]. Further development and renewal of the public's NIMBY attitude is evolved during individual communication in their relationship network. In the whole process of occurring, developing and resolving of the NIMBY incidents, the government plays a very important role in the simulation model of the evolution of the public's NIMBY opinion. One of the important ways for the government to alleviate conflicts is environmental compensation. In addition, the communication barriers between the government and the public lead to NIMBY conflicts in most cases, wherein the media may reduce or increase the gap. The information released by the media has an impact on the public's judgment, position, and opinions on the NIMBY conflict, and thus affects the evolution of NIMBY opinions among the public.

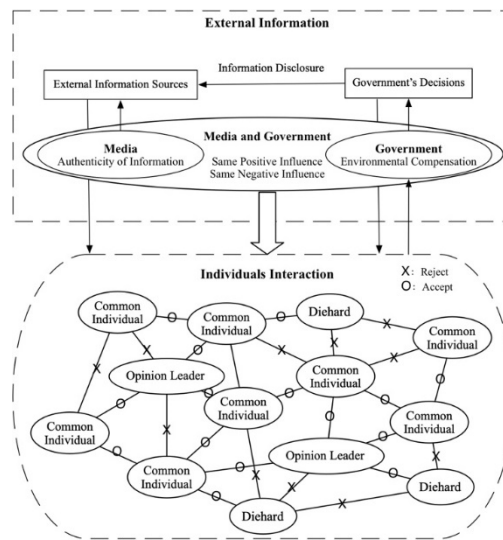


Figure 1. The system structure diagram.

2.2 Exchange Rules Design

$A_{i(t)}$ indicates the public individual i 's NIMBY attitude at time t . Given that the NIMBY attitude represents the public's negative emotion toward the project construction. Thus, when $A_{i(t)} \in [-1, -0.50]$, the public gives an approval for the construction, which is denoted as Negative; when $A_{i(t)} \in [-0.50, 0.50]$, neutrality is indicated, which is denoted as Neutral; when $A_{i(t)} \in (0.50, 1]$, the public is opposed to the construction, which is denoted as Positive. The initial NIMBY attitude $A_{i(0)}$ of the public individual i is set as a function of the distance d_i between the nearest NIMBY facility and the public individual i , that is, $A_{i(0)} = f(d_i)$.

Van der Horst suggested that the relationship between NIMBY attitude and the distance to NIMBY facilities is an inverse S-curve[11] (figure 2).

Therefore, the individual i 's initial attitude $A_{i(0)}$ without any external factor is set as:

$$A_{i(0)} = f(d_i) = \left(\frac{1}{1 + e^{d_i - 5\sqrt{2}}} \right) \quad (1)$$

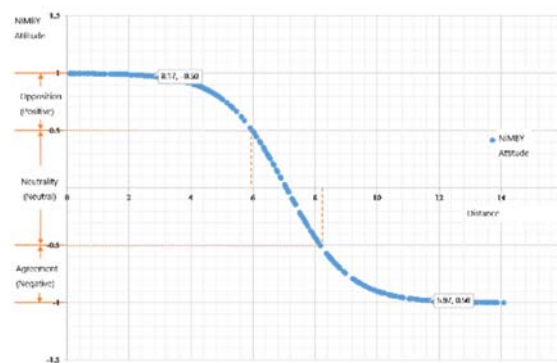


Figure 2. Diagram of the Public's NIMBY attitude changing with the distance.

In HK model [12], the bounded trust parameters of individual opinions are defined according to the hypothesis of bounded trust. Only when the opinion differences among individuals are under the trust threshold will an opinion attain influence. In this study, the bounded trust parameter ε is set as the middle value 0.5 of the value range of $A_{i(t)}$, the attribute of the public individual's NIMBY attitude. If the attitudes of individuals i and j differ, the difference between the two must be ascertained first. If the value of $|A_{i(t)} - A_{j(t)}|$ is in the trust threshold (i.e., $|A_{i(t)} - A_{j(t)}| < \varepsilon$), then the two opinions will

affect each other when they differ in polarity. If their opinion polarity is similar, then the two individuals are strongly similar in their position with regard to a NIMBY incident, and thus they are more likely to have similar opinions.

In the exchange process between public individuals, the degree of individual i 's influence on individual j 's opinion is mainly reflected by individual i 's influence I_i and individual j 's conformity $1/D_j$. Individual j 's conformity is the inverse function of its independence D_j . The larger the value of I_i is, the greater the influence of this individual on others' opinions. The influence of the opinion leader in the group is higher, and its $I_i \in (0.9, 1)$; wherein the larger the value of D_j means the greater immunity to the spreading rumor with regard to an incident.

In addition to opinion leaders, public individuals who always pay close attention to NIMBY incidents and are not easy to compromise or dispel NIMBY opinions also exist. These people are called "diehards" in this study, wherein they still pay attention to certain incidents when the number of their opinion propagation reaches the fatigue limit k ($k \in \{0, 1, 2, 3 \dots\}$)

According to the investigation research on collaborative management of network society [13], $F(z, i, t)$ is set as the coefficient function of the influence of government on individual i 's opinion at time t , whereas $F(m, i, t)$ is set as the coefficient function of the influence of media on individual i 's opinion at time t . Thus,

$$F(z, i, t) = \left(0.3 \cdot \frac{1}{D_i} + 0.3C + 0.2R_g + 0.1E + 0.1H\right) \cdot L_t, \quad (2)$$

$$F(m, i, t) = 0.4 \cdot \frac{1}{D_i} + 0.4F + 0.2R_m. \quad (3)$$

In equation (2), C represents the government's credibility $C \in [0, 1]$. R_g represents the speed at which the government releases information, and $R_g \in [0, 1]$. E represents the degree of the government's environmental compensation, and $E \in [0, 1]$. H represents the degree of the public's participation in decision-making, and $H \in [0, 1]$. L_t represents the government's position on the NIMBY facilities at time t . When $L_t \in [-1, 0)$, the government will make a positive response by refuting rumors; when $L_t = 0$, the government will remain silent; when $L_t \in (0, 1]$, the government will react negatively and cover up the truth.

In equation (3), F represents the authenticity of the information released by media, and $F \in [-1, 1]$; thus, a larger value means greater information authenticity. The closer the value is to 1, the closer the report is to the truth. R_m represents the speed of information dissemination released by media, and $R_m \in [0, 1]$; thus, a larger value means faster speed of information disclosure by the media.

Therefore, in the context of government intervention only and under the exchange among public individuals, the initial NIMBY attitude of individual i is:

$$A_{Gi(0)} = A_{i(0)} + A_{i(0)} \cdot F(z, i, t) \quad (4)$$

In the context of media intervention only and under the exchange among public individuals, the initial NIMBY attitude of individual i is:

$$A_{Mi(0)} = A_{i(0)} + A_{i(0)} \cdot F(m, i, t) \quad (5)$$

2.3 Exchange Process among Public Individuals' Opinions

The specific steps for the public individuals to exchange their opinions are as follows:

Step 1: Select individual i and all other individuals $(1, 2, \dots, i)$ who are under his/her influence W_i as the individual of evolution simulation.

Step 2: Generate a random number q between $[0, 1]$. If $q < P_i$ (possibility of propagation), then propagate i 's opinion; otherwise, do not propagate.

Step 3: Select individual j as the individual who absorbed the propagated opinion.

Step 4: Ascertain whether the polarity of individual i 's opinions and individual j 's opinions is the same. Specifically, judge whether their opposition and approval tendencies are consistent. If

$A_{i(t)} \cdot A_{j(t)} > 0$ or $A_{i(t)} = A_{j(t)} = 0$, then the individual i 's opinions and individual j 's opinions have the same polarity. In this case, execute Step 5; otherwise, execute Step 6.

Step 5: The total number of times (T_i) that individual i is involved in a NIMBY incident is the sum of the total number of acceptance times (T_{i-y}) and rejection times (T_{i-n}), that is, $T_i = T_{i-n} + T_{i-y}$. If the opinion polarity is consistent, then judge the influence of the two individuals. According to Wu et al.'s research on the mental model of Internet users [14], individual i is categorized into three levels based on the influence degree of individual i : less influence ($I_i \in [0, 0.33]$), medium influence ($I_i \in [0.33, 0.67]$), and greater influence ($I_i \in [0.67, 1]$). Therefore, the coefficient function $f(i, j, t)$ of individual i 's influence on individual j 's opinions at time t is shown as follows:

$$f(i, j, t) = \begin{cases} 0.2I_i + 0.4 \frac{1}{D_j}, I_i \in [0, 0.33] \\ 0.3I_i + 0.3 \frac{1}{D_j}, I_i \in [0.33, 0.67], \\ 0.4I_i + 0.2 \frac{1}{D_j}, I_i \in [0.67, 1] \end{cases} \quad (6)$$

(1) If $I_i > I_j$, then individual j 's opinions are influenced by individual i 's opinions. Individual i 's opinions remain unchanged, and the number of times that individual i 's opinions are accepted is increased by 1.

$$\begin{aligned} A_{j(t+1)} &= A_{j(t)} + |A_{i(t)} - A_{j(t)}| \cdot f(i, j, t) \\ A_{i(t+1)} &= A_{i(t)} \\ T_{i-y} &= T_{i-y} + 1, \end{aligned} \quad (7)$$

(2) If $I_i < I_j$, then individual j 's opinions remain unchanged. Moreover, individual i 's opinions are influenced by individual j 's opinions, and the number of times that individual i 's opinions is rejected is increased by 1.

$$\begin{aligned} A_{j(t+1)} &= A_{j(t)} \\ A_{i(t+1)} &= A_{i(t)} + |A_{i(t)} - A_{j(t)}| \cdot f(j, i, t) \\ T_{i-n} &= T_{i-n} + 1, \end{aligned} \quad (8)$$

Step 6: If the opinion polarity is inconsistent, calculate the difference between the two attitudes first. If $|A_{i(t)} - A_{j(t)}| > 0.5$, execute Step 5; otherwise, do not execute the step, which means individual i 's opinions and individual j 's opinions remain unchanged, and the number of times that individual i 's opinions are rejected is increased by 1.

Step 7: After individual i completes the communication and opinion propagation with individual j , his/her comprehensive quality (Q_i) is improved and the increment factor is β_1 , set $Q_i = Q_i \cdot (1 + \beta_1)$.

Step 8: Identify whether individual i reaches the fatigue limit. A random positive integer k is set. If $T_i < k$, then individual i does not reach the fatigue limit. Specifically, this means he/she still pays close attention to a NIMBY incident, wherein the independence D_i remains unchanged. Otherwise, individual i has reached the fatigue limit. Then, judge whether individual i is a diehard by generating a random number m ($m \in [0, 1]$) and comparing it with a preset parameter w ($w \in [0, 1]$), which is used to judge whether the individual is a diehard. If $m > w$, then individual i is a diehard and will continue to pay attention to a NIMBY incident and spread opinions. If $m < w$, then individual i is not a diehard, whose attention to a NIMBY incident will decrease as reflected in the increase of independence: $D_i = D_i + \beta_2 \cdot Q_i \cdot I_i$.

Step 9: When individual i completes the communication and opinion propagation with all the individuals within his/her influence scope, his/her influence, communication possibility, and influence scope will change accordingly:

$$I_i = I_i \cdot (1 + \alpha_1 \cdot \frac{(T_y - T_n)}{|T_y - T_n|}); P_i = P_i \cdot (1 + \alpha_2 \cdot \frac{(T_y - T_n)}{|T_y - T_n|}); W_i = W_i \cdot (1 + \alpha_3 \cdot \frac{(T_y - T_n)}{|T_y - T_n|}). \quad (9)$$

3. Experiment Scenarios Design

The number of public participants (N) in the opinion evolution in the simulation model is set as 100. The locations of all the public individuals and NIMBY facilities are virtualized into a coordinate point in a 2D space. The coordinates of the NIMBY facilities are (0,0). The public individuals are randomly distributed in a two-dimensional space of 20×20 , and the coordinates (x_i, y_i) are generated randomly.

The distance between individual i and the NIMBY facilities is $d_i = \sqrt{(x_i^2 + y_i^2)}$. Comprehensive qualities of different individuals are divided into three levels: relatively high level (Q_i^1), medium level (Q_i^2), and relatively low level (Q_i^3), which respectively obey the normal distributions $Q_i^1 \sim N_{(0.8,0.2)}$, $Q_i^2 \sim N_{(0.5,0.2)}$, and $Q_i^3 \sim N_{(0.2,0.2)}$ [15]. At the same time, the values of the public individual's propagation possibility P_i , independence D_i , and influence I_i are all assumed to obey uniform distribution. The fatigue limit k is set as 5, the upper limit of fatigue limit is 20, the degree of public participation in decision-making H is 0.5, the preset parameter w for judging whether an individual is a diehard is 0.5, $\beta_1 = \beta_2 = 0.1$, and $\alpha_1 = \alpha_2 = \alpha_3 = 0.1$. The number of acceptance and rejection of individual i 's opinions is 0. The step size of each model is set as 10, representing the average value of the upper and lower limits of the fatigue limit value range; whereas the number of rerunning the simulation model is 15. In the real situation of NIMBY incidents, the whole duration of the NIMBY incident is generally 1–5 years [16]. In this study, 6.25 years is considered enough to cover the whole process of the occurrence and development of a NIMBY incident.

4. Simulation Results and Discussions

The situation of opinion exchange between the public at every time step can be known by observing the time sequence diagrams of the opinion acceptance number from the simulation (figure 3, figure 6, figure 7 and figure 9). Then, the evolution trend of the public's opinion exchange and the general time process of NIMBY conflicts can be obtained. In addition, during the public's NIMBY opinion exchange, the public's NIMBY attitude also changes. Thus, the evolution of the public's NIMBY attitude is explored in this study by analyzing the change of average number of individuals with different attitudes, represented as the time sequence diagrams of the number of opinions in different attitude types (figure 4, figure 5 and figure 8). Accordingly, the influence of the number of opinion leaders, the number of diehards, government intervention, media intervention and other factors on the evolution of the public's attitudes can be studied through further simulation, such as changing relevant parameters, and exploration of its impact on the NIMBY conflict process.

4.1 Simulation of Public's NIMBY Opinion Evolution without External Influence

Figure 3 is a time sequence diagram of the number of opinions accepted by the public without external influence. With the increase of the number of opinion leaders greatly (full line), the opinion exchange happens more frequently in the public than in default situations (long-dash line), given that opinion leaders have a higher frequency of opinion propagation and their opinions are more easily accepted by others. When the number of diehards increases (dot-dash line), the existence of diehards will also increase the interaction of opinions, but the impact on the public in the early stage is lower. Moreover, their high fatigue limit leads them to a high focus on the incident, therefore the influence of diehards on the public's attitude is more sustainable.

Next, we extract the long-dash line (default condition) from figure 3 and observe its evolution trend. The evolution of the public's NIMBY attitude can be roughly divided into five stages: incubation, outbreak, continuous attention, regression, and rebound (figure 4). The characteristics of relatively long incubation period and long-term continuous attention have appeared in the evolution simulation. Such evolution characteristics are closely related to the specific stage, which is from individual rationality to group rationality in the NIMBY incident. This finding can facilitate the government's governance, and promote the public's rational participation in NIMBY project.

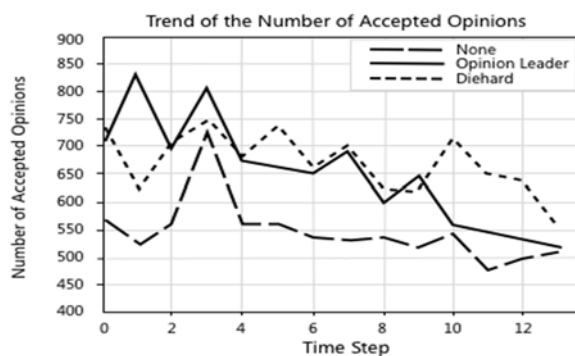


Figure 3. The time sequence diagram of the number of opinions accepted by the public without external influence.

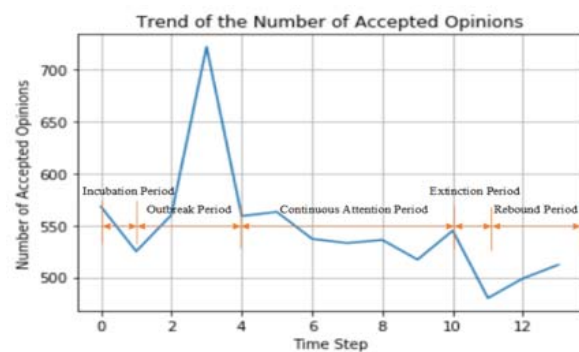


Figure 4. The number of the opinions accepted by the public and the development stage of NIMBY conflicts.

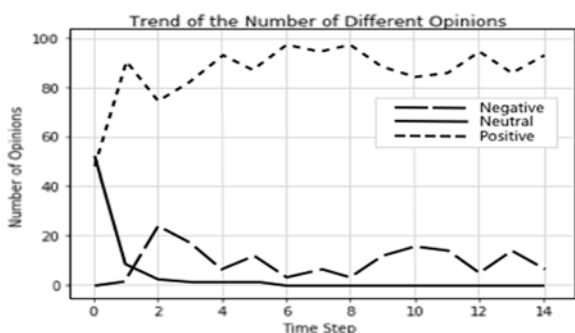


Figure 5. The average number of individuals with different opinions under default circumstances.

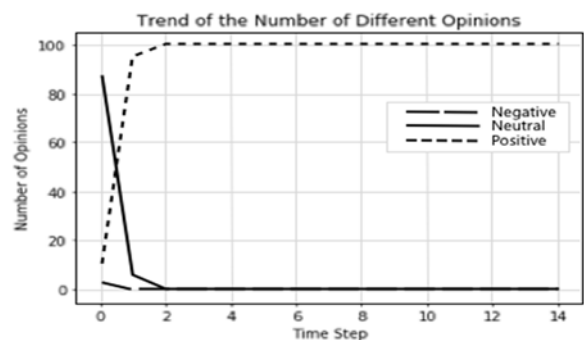


Figure 6. The average number of individuals with different opinions after increasing the number of opinion leaders.

Figures 5 and 6 show the time sequence diagrams of the average number of the individuals with different opinions when initializing and increasing opinion leaders without external influence. The results indicate that opinion leaders have a strong guiding role in the public's NIMBY attitude. Thus, public individuals who had neutral attitudes originally quickly build a new NIMBY attitude. Opinion leaders play a leading role in the direction of the public's opinions and promote the exchange of the public's opinions and the evolution of their attitudes. In a NIMBY incident, opinion leaders have great energy in fermenting the incident and guiding the public's opinions.

4.2 Simulation of the Public's Opinion Evolution under the Respective Intervention of the Government and the Media

Figure 7 shows the time sequence diagram of the average number of times that the public's opinions are accepted under the external environment where the government has participated. When the government provides a high amount of environmental compensation to the public (full line), the average number of the public's accepted opinions has gradually decreased from 800 to 400 with fluctuations as a whole over time. However, when the government does not provide environmental compensation to the public (long-dash line), the average number of the public's accepted opinions maintains at a relatively high level.

Figure 8 presents the time sequence diagram of the average number of individuals with different attitudes when the government provides high environmental compensation to the public. Initially, after the increase at the early stage, the number of individuals with opposing attitudes (dot-dash line) declined at the 6th time step, but the decline did not last and finally picked up. This indicates that the government's environmental compensation to the public can play a role in alleviating the public's NIMBY syndrome in a short time, but it cannot avoid the NIMBY conflict substantially and fundamentally.

In sum, when the amount of government's environmental compensation to the public is relatively low, the number of the public's exchange of opinions will maintain at a high level. However, when the amount of environmental compensation increases, the average number of the public's accepted opinions decreases.

The public changes their NIMBY attitudes, wherein some individuals change from opposition to approval. However, the government's environmental compensation can only change the public's NIMBY attitude in a short time and cannot change NIMBY conflicts fundamentally.

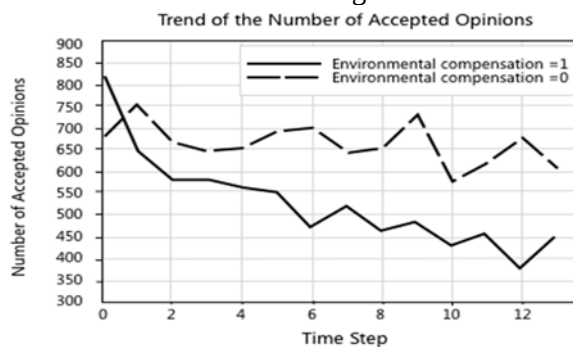


Figure 7. The time sequence diagram of the opinions accepted by the public under the government's participation

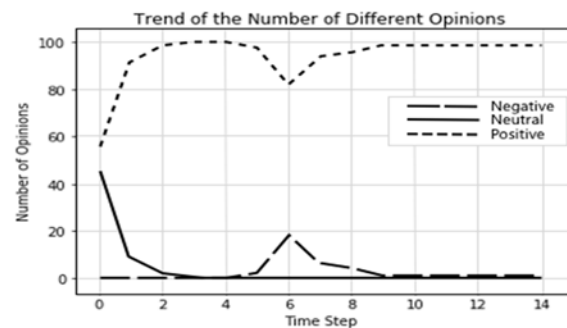


Figure 8. The average number of the public individuals with different attitude types with government's compensation

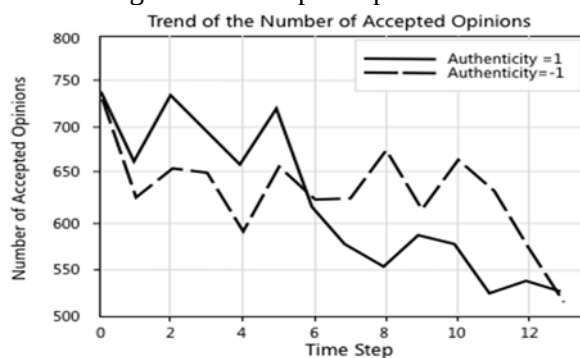


Figure 9. The time sequence diagram of the opinions accepted by the public under the media's intervention.

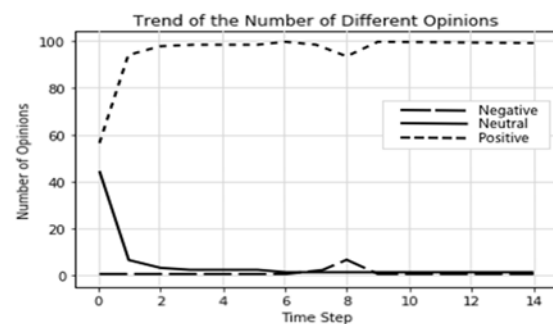


Figure 10. The average number of the public individuals with different attitude types with high authenticity of media.

Figure 9 shows the time sequence diagram of the average number of times that the public's opinions are accepted under the external environment where the media has participated. When the authenticity of the information released by the media is very high (full line), the number of opinions accepted by the public remains high (around 700) at first but fluctuates and declines over time on the whole. When the authenticity of the information is very low (long-dash line), such occurrence calms down the public opinions in a short time. However, after the public later recognizes the false information, the number of the public's exchange opinions rises again compared with the situation that the information authenticity is high. Figure 10 also demonstrates that although the number of individuals with supporting attitudes (long-dash line) increases initially, the incline did not last and finally decreases. Therefore, in the long run, a higher authenticity of the information released by the media facilitates stability in the evolution of the public's NIMBY opinions and has a positive impact on the solution to the NIMBY incident.

5. Conclusions

An agent-based simulation model involving the government, the media, and the public is developed in this study by introducing the opinion dynamics and social learning theories. Compared with the existing research, the theoretical contributions in this study are as follows:

First, this study focuses on the evolution of the public's NIMBY attitude rather than the development of the NIMBY conflict in a traditional way. Second, opinion dynamics and social learning theories are used to build a simulation scenario of the evolution of the public's attitude toward a NIMBY incident. Third, this study considers the characteristics and interaction of the internal heterogeneity of the public group, in particular, the role of opinion leaders and other special characters from the micro level in the NIMBY conflict. In sum, this study aims to clarify the complex characteristics of various subjects and

their interactions in NIMBY conflict, and widen the investigation on the emergence mechanism of the NIMBY attitude from micro to macro level.

In conclusion, the trend and the internal mechanism of the evolution of the public's attitudes are investigated in this study. The parameter value can be optimized further in future research through a large number of in-depth NIMBY incidents. Moreover, the simulation scenario settings of the model might be fully considered to conduct a more accurate simulation that is close to the reality of NIMBY incidents.

Acknowledgments

This work was supported by the National Natural Science Foundation of China (Nos. 71671088, 71732003, 71841026); Sponsorship of Jiangsu Overseas Visiting Scholar Program for University Prominent Young & Middle-aged Teachers and Presidents in 2019.

References

- [1] Bell D, et al. 2013, Re-visiting the 'social gap': public opinion and relations of power in the local politics of wind energy. *Environmental Politics*. 22(1), 115-135.
- [2] Shumway J M and Jackson R H. 2019, Place Making, Hazardous Waste, and The Development Of Tooele County, Utah. *Geographical Review*. 98(4), 433-455.
- [3] Eranti V. 2016, Re-visiting NIMBY: From conflicting interests to conflicting valuations. *The Sociological Review*. 65(2), 285-301.
- [4] Jinbu Zhao Y N, Kui Liu and Jizhi Zhou. 2020, Evolution of the Individual Attitude in the Risk Decision of Waste Incinerator Construction: Cellular Automaton Model. *Sustainability*. 12(1), 368.
- [5] Vittes M E. 1993, Factors contributing to NIMBY attitudes. *Waste Management*. 13(2), 125-129.
- [6] Chen X, et al. 2016, Trend prediction of internet public opinion based on collaborative filtering, in 2016 12th International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD). IEEE.
- [7] Yong L, Li L, Kai Z. 2015, Modeling and analysis the evolution of herding behavior in public opinion propagation. in 2015 International Conference on Cyber-Enabled Distributed Computing and Knowledge Discovery. IEEE.
- [8] Peng W, et al. 2015, Agent-based modeling and simulation of evolution of netizen crowd behavior in unexpected events public opinion. *Data Analysis and Knowledge Discovery*. 31(7-8), 65-72.
- [9] Krause R M, et al. 2014, "Not in (or under) my backyard": geographic proximity and public acceptance of carbon capture and storage facilities. *Risk Analysis*. 34(3), 529-540.
- [10] Schively C. 2007, Understanding the NIMBY and LULU phenomena: Reassessing our knowledge base and informing future research. *Journal of planning literature*. 21(3), 255-266.
- [11] Van der Horst D. 2007, NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies. *Energy policy*. 35(5), 2705-2714.
- [12] Hegselmann R and Krause U. 2002, Opinion dynamics and bounded confidence models, analysis, and simulation. *Journal of artificial societies and social simulation*. 5(3), 1-2.
- [13] Qiang S and Wu P. 2014, Simulation study on netizen group behavior during the evolution of online public opinion in emergencies. *Data analysis and knowledge discovery*. 30(6), 71-78.
- [14] Wu P, S Qiang, M Yan. 2012, Mental model for understanding website categories based on multidimensional scaling: The case of government websites. *Journal of The China Society for Scientific and Technical Information*. 31(4), 436-448.
- [15] Zhu Y, Zhang C, Zheng D, Tan T. 2013, Research on online public opinion management from the perspective of information ecology. *Information theory and practice*. 36(11), 90-95.
- [16] Hsu S H. 2006, NIMBY opposition and solid waste incinerator siting in democratizing Taiwan. *The Social Science Journal*. 43(3), 453-459.