



The Use of the Natuna Game About the Natural Wealth of the Natuna Marine on National Awareness of the Post-Millennial Generation

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ABSTRACT

This research aims to explain the influence of using Natuna games in understanding natural wealth on the national consciousness of the post-millennial generation (Gen-Z). The method used is Design-based Research, through the stages of analysis, design, development, and evaluation. The results of the research are in the form of Game Natuna. Several validation tests were carried out on the product, namely in terms of material, media, and readability for representatives of the Gen-Z with a validation percentage in terms of material, media, and readability respectively of 95.22, 90.25, and 92.60%. Apart from that, a media implementation was also carried out on 80 Gen-Z people, where the results showed there was a significant difference in national awareness of Gen-Z who used Natuna games compared to Gen-Z who did not use Natuna games. Where students who use the Natuna game have an average national awareness score of 84.10, while those who don't use the Natuna game have an average score of 81.60. It can be concluded that the game Natuna Media developed is very suitable for use and is expected to increase awareness across generations in maintaining national resilience. It is recommended for further research to develop the Natuna game more widely and increase the sense of national awareness.

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1. INTRODUCTION

National consciousness is the main foundation of a country (Rizal, 2019). In democratization, there is the influence of national awareness and mentality. The development of a mature society can be seen from the level of formation of national mentality and awareness (Widyastuti, 2021). Post-millennials or Generation Z or Gen-Z, which is the next generation to defend state sovereignty, is the most important factor in instilling national awareness, love of the homeland, and fighting to defend the country (Azkiya et al., 2023; Candra et al., 2021; Billano et al., 2021; Theron et al., 2024; Anisah et al., 2024).

Every citizen, especially the Gen-Z, is the next generation for the continuity of national and state life who must be well prepared (Mukhtadi & Komala, 2018; Mulyono et al., 2021), regarding their rights and obligations in efforts to defend the country and efforts to defend national security (Wolfers, 1952). Strengthening Defence and National Defence is an attitude and behavior that must be possessed by every citizen who is imbued with love for the Unitary State of the Republic of Indonesia which is based on Pancasila and the 1945 Constitution to ensure the survival of the nation and state as a whole (Ahyati & Dewi, 2021). Instilling the values of national defense in the millennial generation, as the heir and successor generation, continuity of national and state life is an absolute thing that must be done as early as possible, considering that the challenges faced by Gen-Z are very varied and complex.

The characteristics of Gen-Z are that they prioritize the use of this technology (Hayu, 2019), and many IT-based learning media such as comics, films, videos (Tirtoni, 2022), or games were created to increase national awareness of Gen-Z (Fadilah et al., 2014) to instill awareness of conflict that occurs. It must be traced from various aspects. It must be known, starting from the cause of the conflict, knowledge about existing natural resources, and political science about national boundaries that must be understood and traversed by Gen-Z to their feelings and awareness. The nation grows in it, and the media that is suitable for providing information and raising awareness is the media of games. This game media is currently hot and in demand by Gen-Z. Based on this background, it is necessary to develop Natuna game media creations to increase national awareness in Gen-Z.

This research aims to explain the influence of the use of the Natuna game in understanding natural wealth on the national awareness of the post-millennial generation (Gen-Z), in making the game using the Design-based Research method, through the stages of analysis, design, development, and evaluation, with It is hoped that this research can produce a Natuna game that can significantly differentiate the level of national awareness of Gen-Z in maintaining national resilience.

This research is very important to carry out because based on the results of the bibliometric analysis that has been carried out, research on national awareness is a research theme that is currently trending, especially those related to the awareness of various generations, such as regarding awareness of climate change that is occurring (Ibrahim et al., 2024). **Figure 1** shows a significant increase in research over the 20 years from 2003 to 2023, Apart from that most research occurred in 2022, although in fact in several years there was a decrease, overall research interest is still increasing in researching the theme of awareness in cross-generation.

Bibliometric analysis is carried out to see trends and how important the topic research is, namely using the publish or perish application to collect data from Scopus and using the VosViewer application to visualize the network between research that has been carried out and the depth of the topics that have been discussed from the previous year. Even though you can use R Studio (Susilawati et al., 2024) to visualize, the bibliometric analysis is carried out as has been done in previous research as in **Table 1**.

Table 1. Previous studies on bibliometrics.

Ref	Title	Result
Susilawati <i>et al.</i> (2022)	Research Trends about internet of things in Science Education: A bibliometric analysis	Research on IoT in science education is still very low, and only a few countries have just researched IoT in science education.
Al Husaeni (2022)	Bibliometric analysis of briquette research trends during the Covid-19 pandemic.	A review of 973 pertinent papers on briquettes was analyzed using VOSviewer, bibliometric analysis, and data mapping; the results showed a decline in research over the previous three years as a result of the COVID-19 pandemic.
Ragadhita & Nandiyanto (2022)	Computational bibliometric analysis on publication of techno-economic education.	A study on science and Islamic research that employed data from the Scopus database from 2012 to 2022 and VOSviewer for bibliometric analysis found a reduction in research, mainly in Indonesia and Malaysia.
Al Husaeni & Nandiyanto (2022)	Bibliometric computational mapping analysis of publications on mechanical engineering education using VOSviewer	A study that used VOSviewer to chart the development of nano propolis research over the last ten years found a spike in research on nanoparticles and propolis.
Nandiyanto <i>et al.</i> (2023a)	Particulate matter emission from combustion and non-combustion automotive engine process: review and computational bibliometric analysis on its source, sizes, and health and lung impact	This study discusses the growth trend of scientific publications on the topic of particulate matter identified based on several categories such as the most cited, publisher, author, country, and affiliation.
Nandiyanto <i>et al.</i> (2023b)	Involving Particle Technology in Computational Fluid Dynamics Research: A Bibliometric Analysis	This research was conducted to determine (i) the growth in the number of scientific publications in the field of particle technology in computational fluid dynamics (CFD), (ii) top citations based on the number of citations, publisher, and country, (iii) visualization of the most productive author, and (iv) publication development map based on keywords.
Al Husaeni <i>et al.</i> (2022)	How Language and Technology Can Improve Student Learning Quality in Engineering? Definition, Factors for Enhancing Students Comprehension, and Computational Bibliometric Analysis	The research aims to review developments in language and technology research that can improve the quality of teaching and learning in engineering. Several factors that can influence the teaching and learning process are explained, supported by a bibliometric analysis (with keywords "Language" AND "Engineering Learning" from Google Scholar from 2020 to 2022).
Nandiyanto <i>et al.</i> (2023c)	Bibliometric data analysis of research on resin-based brakepads from 2012 to 2021 using VOSviewer mapping analysis computations	This study aims to analyze and demonstrate step-by-step bibliometric data analysis using VOSviewer completely and systematically. The analysis was carried out with the number of publications obtained, relating to the predetermined topics totaling 88 documents in 2017-2021.
Susilawati <i>et al.</i> (2023)	Research trends about STEM of Internet of things for science teachers: A bibliometric analysis	This study aims to analyze research trends about STEM Learning with the Internet of Things for science teachers by year, subject area, and country, and then visualization using Vos Viewer for deep research and networking with the other keywords.

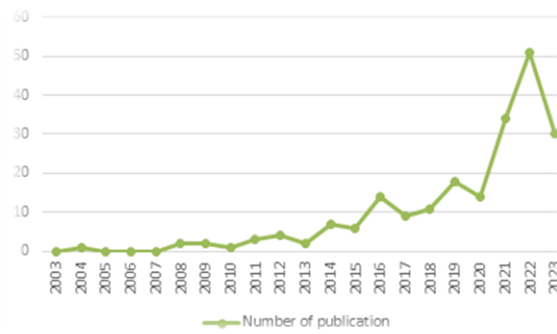


Figure 1. Increasing number of articles (Ibrahim et al., 2024).

2. LITERATURE REVIEW

Natuna Island is an island that is astronomically located at positions 3° North Latitude (N) to 4° 46' (N) and 107° 45' East Longitude (E) to 108° 23' E. Natuna Island borders on the north with the South China Sea, on the south with Bintan Regency, on the west with the Malaysian peninsula, and on the east with the South China Sea (see **Figure 2**).

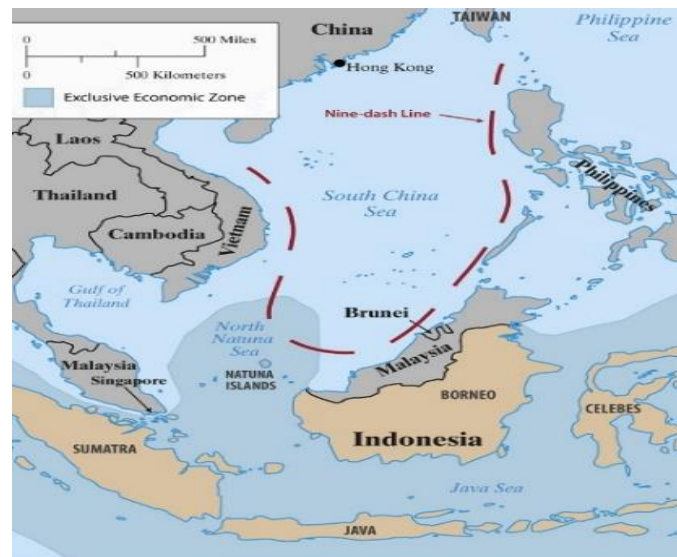
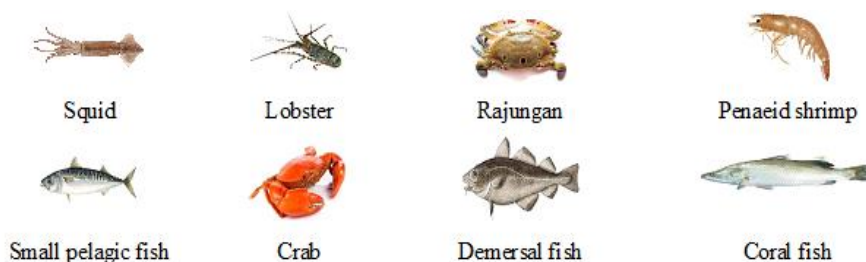


Figure 2. Geographical location of Natuna Islands.

Natuna's marine natural resources are enormous, including 36 million barrels of oil and the East Natuna block contains gas volumes in place or initial Gas in Place (IGIP) of 222 trillion cubic feet (tcf) and reserves of 46 tcf. Apart from that, Natuna's potential marine fish resources are very abundant (see **Table 2**) such as crab, rajungan, lobster, squid, penaeid shrimp, coral fish, demersal fish, small pelagic fish (see **Figure 3**). Of the many fish potentials in the Natuna Sea in 2014, there were still many that had not been exploited (see **Table 3**). Not only are natural resources abundant, but the strategic location of the Natuna Sea as a trade route has given rise to many historical treasures in the form of relics from the Song dynasty in 960-1279 AD and the Qing dynasty in the 17th century. The large amount of natural wealth found in the Natuna Sea and Natuna's geographic location, which borders many countries, is a huge potential in the struggle for territory. This is following several conflicts that have occurred around the Natuna Sea, between Indonesian defense forces and illegal fishermen who have entered the Natuna Area. Therefore, state resilience and national awareness need to be instilled in the nation's future generations.

Table 2. Potential Natuna marine fish resources.

Year	Potential (ton/year)	% from WPR RI	Number of catches allowed (ton)
2011	504.212	50%	403.370
2014	327.976	46%	262.380

**Figure 3.** Types of fish that have potential in the Natuna Sea.

The natural wealth on Natuna Island can be used as a state asset (Putri & Salim, 2020), and many raw materials can be utilized, apart from that many economic and industrial sectors can be developed on Natuna Island, including the fisheries sector, shipping, floating net cage cultivation, fishing with rods, and people's shipping routes. Apart from abundant marine resources, existing mining is also very large. This can be seen from the activities of installing cable pipes, deep sea bailing (mining tailings into the sea) non B3 (dangerous and toxic materials) (Winckler *et al.*, 2000), coral reef rehabilitation, marine tourism (snorkeling) (Piñeiro-Corbeira *et al.*, 2020), utilization of sea sand, and oil and gas. This abundance of natural wealth has led to competition from external parties, especially from several countries that directly border Natuna Island. This is why Indonesia must have strong state resilience, where the resilience carried out can be implemented at the bottom, surface, and sea columns. If the areas between the Natuna Sea are not regulated, then the use of sea space will overlap and the various benefits obtained will not be optimal (Anggraini *et al.*, 2019).

Table 3. Level of fish utilization in the Natuna Sea in 2014.

Types of Fish	Pelagic Fish	Demersal Fish
Description	Fish that live on the surface of the water in pools between 0-200 m	Fish that live their lives on the seabed
Examples of Fish	Tuna, swordfish, marlin, skipjack, mackerel, and others	Benthic fish dan benthopelagic
Amount utilized (tons/year)	99.037	40.491
Unutilized amount (tons/year)	163.343	119.209
Total potential (tons/year)	262.380	159.700

National awareness needs to be instilled in students at school. This should be implemented and evaluated to increase national awareness through appropriate learning media. Games are one of the effective media used in the world of education (Girard *et al.*, 2013). **Table 4** shows several studies that have been carried out to increase student's awareness and interest in understanding the content and contextual material provided by using games (Douven *et al.*, 2014; Tsai *et al.*, 2015; Tan & Nurul-Asna, 2024; Rodela *et al.*, 2019; Ranchhod *et al.*, 2014; Knogler & Lewalter, 2014). The use of games in efforts to increase competence and psychomotor skills regarding national awareness, especially concern for Natuna Island, is expected to be able to provide information on the natural conditions of Natuna and the situation that occurred regarding the attack on Natuna Island.

Table 4. Previous research on the use of games in education.

Ref	Title	Result
Douven et al. (2014)	Games to create awareness and design policies for transboundary cooperation in river basins: Lessons from the shariva game of the Mekong river commission.	Playing the game proved an important aspect in the training and education of such complex systems. The study also shows the role games can play in policy analysis, in particular the way the game provided insight into the design of the policy and the development of procedures, and their function to review and update policies and procedures.
Tsai et al. (2015)	The effectiveness of a flood protection computer game for disaster education.	This study throws some light on the potential of simulation-based Serious Games to offer experiential learning and engage users with serious topics while raising public awareness and understanding of social issues such as flooding and related policymaking
Tan & Nurul-Asna (2023)	Serious games for environmental education.	Serious games are increasingly being digitized and moving towards location-based games, alternate reality, augmented reality, and virtual reality. These games can facilitate interaction between learners and the natural environment, and in turn, strengthen environmental awareness and appreciation.
Rodela et al. (2019)	Conceptualizing serious games as a learning-based intervention in the context of natural resources and environmental governance.	An illustrative case of a serious game (developed as part of the Assessing the Learning Effects of Games on Attitude of Stakeholders toward Sustainable Shrimp Farming – ALEGAMS research project) we reflect on a few key aspects of game use. Developing a serious game needs several iterations and, although the learning outcomes can be assessed, the impact of games aiming at changes in current practice and policy will likely fall beyond the timespan of usual project periods
Ranchhod et al. (2014)	Evaluating the educational effectiveness of simulation games: A value generation model.	The participants' perception regarding the professional skills developed during the simulation game determines their affective evaluation of the Markstrat exercise. The model presented in this study is generalizable to other simulation games, and to other academic disciplines that implement the same experiential learning approach .
Knogler & Lewalter (2014)	What Makes Simulation Games Motivating? Design-Based Research on Learners' Motivation in Simulation Gaming.	Investigated the subsample of the re-design condition to determine whether students' in-game experiences of situational interest are related to students' interest in the issue of energy supply, the main topic of the intervention. Considered together, the studies helped to empirically identify effective design features and possible mechanisms of how simulation games may foster both students' appreciation of the value of science and their interest in science-related issues

3. METHOD

The research used Design-Based Research (DBR), using four steps, namely: analysis, design, development, and evaluation. In the analysis step, the need for innovative delivery to cross generations, especially Gen-Z who are already accustomed to the use of technology, Gen-Z's penchant for playing games in everyday life motivates them to use game media to understand the teaching material we want to provide to students. Then, the design stage was carried out in the form of a game Natuna media design regarding Natuna's natural marine resources. This

was carried out as a development stage and validation tests were carried out from media experts. In addition to the validation test, a limited trial was carried out on 80 Generation Post-Millennial (Gen-Z) people, they are class IX students of 25 State Junior High Schools in Bekasi City, where 40 students used the Natuna game, and 40 students did not use the Natuna game. The instrument used to measure the knowledge, attitudes, and multiplicative actions of post-millennials was developed by researchers. Knowledge consists of 10 items with true (1) and false (0) statements, and attitude consists of 15 items with a Likert scale of 1-4. Researchers were also interviewed about their opinions and action plans that they would carry out as agents of and were committed to carrying out multiplicative actions as a form of national awareness of the Gen-Z, especially the interest in maintaining the natural wealth of the Natuna Sea.

4. RESULTS AND DISCUSSION

The results obtained from the Augmented Reality (AR) media using the DBR process on climate change include Analysis, Design, Development, and Evaluation. Many reports regarding AR have been well-documented (Angraini *et al.*, 2024; Bangkerd & Sangsawang, 2021; Albar *et al.*, 2021). The analysis was carried out by observing generational human awareness in facing the condition of Natuna's marine natural resources, then analyzing the need for innovative delivery to Gen-Z who are already accustomed to the use of technology, regarding the importance of understanding state resilience in maintaining Natuna Sea.

The results of the analysis include: 1) every generation needs to be given treatment. In this way, there is an increase in awareness of the country's resilience, especially in maintaining natural wealth in the Natuna Sea, which needs to be instilled in the Gen-Z as the nation's successor. 2) The treatment given to increase awareness of Gen-Z must be provided using media assistance that is appropriate to the characteristics of that generation. Alone. One of the developments that can be carried out is by adding media assistance to the Natuna game technology which is adapted to the Gen-Z by adding natural riches in the Natuna Sea and conflicts between countries fighting over the natural riches of the Natuna Sea. This is because games can increase understanding and motivation in studying certain material or conditions [40]. Game Natuna design is then created that is tailored to your needs. The sketch or storyboard for the Game Natuna is in **Figure 4**.

The view page in the process running every stage in Game Natuna is in **Figure 5**. The development stage in creating the game is done at the end of the media, where users or validators consider it necessary to have a stage that depicts the conflict between countries in seizing the natural wealth of the Natuna Sea. and the resilience of the Republic of Indonesia and fighting enemies. This conflict stage is kept at the final stage where there is special resistance to monsters as a country that will seize the natural riches of the Natuna sea.

In the step on evaluation, Game Natuna media about the natural wealth of the Natuna Sea was validated by language and media experts, where the indicators used included suitability of material, media, and readability (Fadilah *et al.*, 2024). Several validation tests were carried out on the product, namely in terms of material, media, and user readability. With validation percentages in terms of material, media, and readability of 95.22, 90.25, and 92.60% respectively. The Game Natuna developed has validity in the very good category in terms of material, media, and legitimacy.

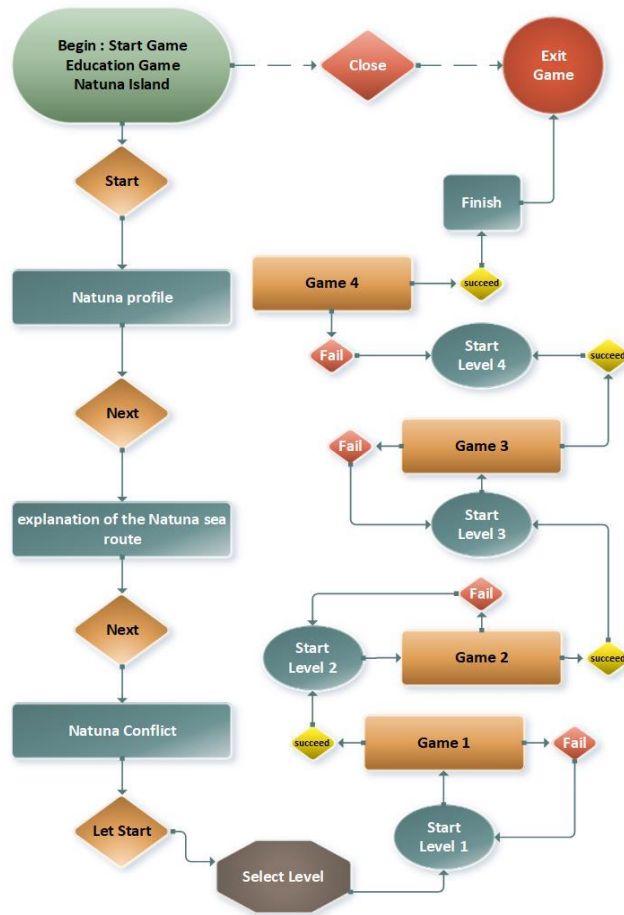


Figure 4. Design sketch for the game Natuna.

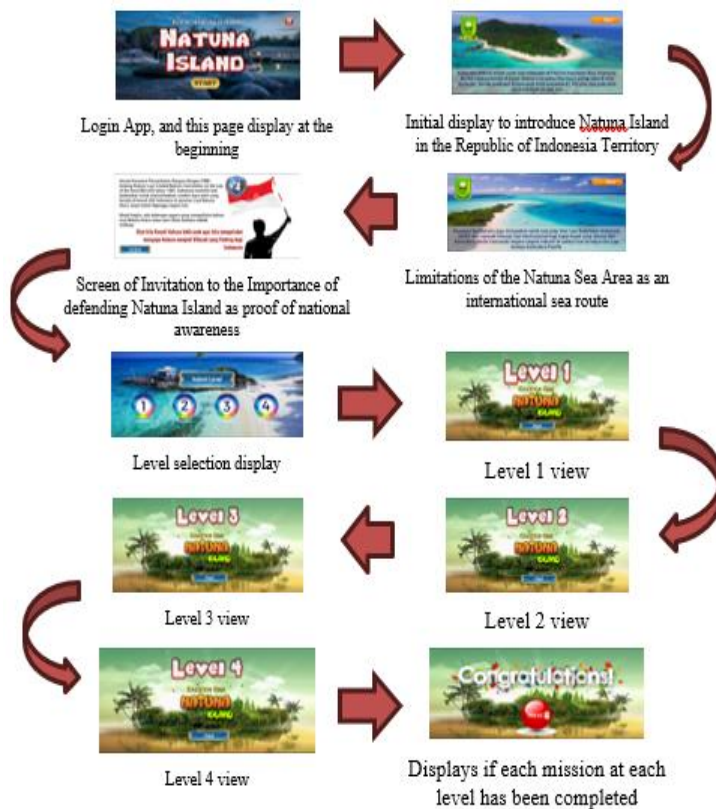


Figure 5. Process use the Game Natuna.

With the rapid development of technology today, there is a need for media or tools to explain information and encourage changes in awareness (Stephen *et al.*, 2024; Soetan *et al.*, 2023; Cruz *et al.*, 2022; Ekunola *et al.*, 2022; Agarry *et al.*, 2023; Olatunji & Babalola, 2022; Keisyafa *et al.*, 2024). Specifically, the Gen-Z needs practical, effective, interesting, and interactive with more meaningful functions. This can also be seen from implementation test results, where the average increase in awareness across Gen-Z that use game Natuna (class Y) for all components is in the high category, but for not using game Natuna (class X) for all components is in the medium category (Table 5). In this case, the choice of Game Natuna is aimed at achieving the tasks and goals of increasing Gen-Z awareness as expected (Mamun *et al.*, 2022). Providing clearer information can help media users understand the importance of awareness in defending territory and making the best use of the country's natural resources (Thiounn & Smith, 2020).

Table 5. Differences in national awareness scores between groups who use the Natuna game and groups who do not use the Natuna game.

Variable	Class	Mean			Conclusion	
		Before	After	Difference	N-gain	Category
National/Affective Sense	X	50.00	80.21	30.21	0.60	Medium
	Y	42.00	90.20	0.19	0.83	High
National/Cognitive Understanding	X	60.18	86.60	0.30	0.66	Medium
	Y	50.56	90.60	4.89	0.81	High
National spirit/Psychomotor	X	43.16	80.60	0.28	0.66	Medium
	Y	40.54	88.40	9.17	0.80	High

National awareness in defending the country is an attitude that is needed to protect the country (Dwipayana *et al.*, 2022). Not only in terms of maintaining existing natural wealth, but nature conservation must also be done well, because the attitude of protecting the environment and preserving what exists will have an impact on the implementation of sustainable living in a country, such as climate change that is occurring throughout the world, one of the consequences of a culture of human behavior that is not environmentally friendly, resulting in climate change. Cross-generational awareness of climate change is very closely related and is currently a trend discussed in many studies. Figure 6 explains that research on generational awareness with climate change has a very close relationship with other research keywords, this shows that people are more interested in discussing the climate change and cross-generations of each nation.

The existence of national awareness can be seen in the results of the bibliometric analysis in the visualization in Figure 7. That research on national awareness is research that is of great interest, where it can be seen that the depth of discussion about national awareness is very deep compared to other themes. With national awareness, national resilience will also be implemented as regional resilience (DeWit *et al.*, 2020), following this research, having national awareness can recognize parts of the country that are crucial for it to be defended, and require full attention, especially the introduction of special areas such as defending islands. Natuna from several countries use game media as a means of providing information to students in class and society in general.

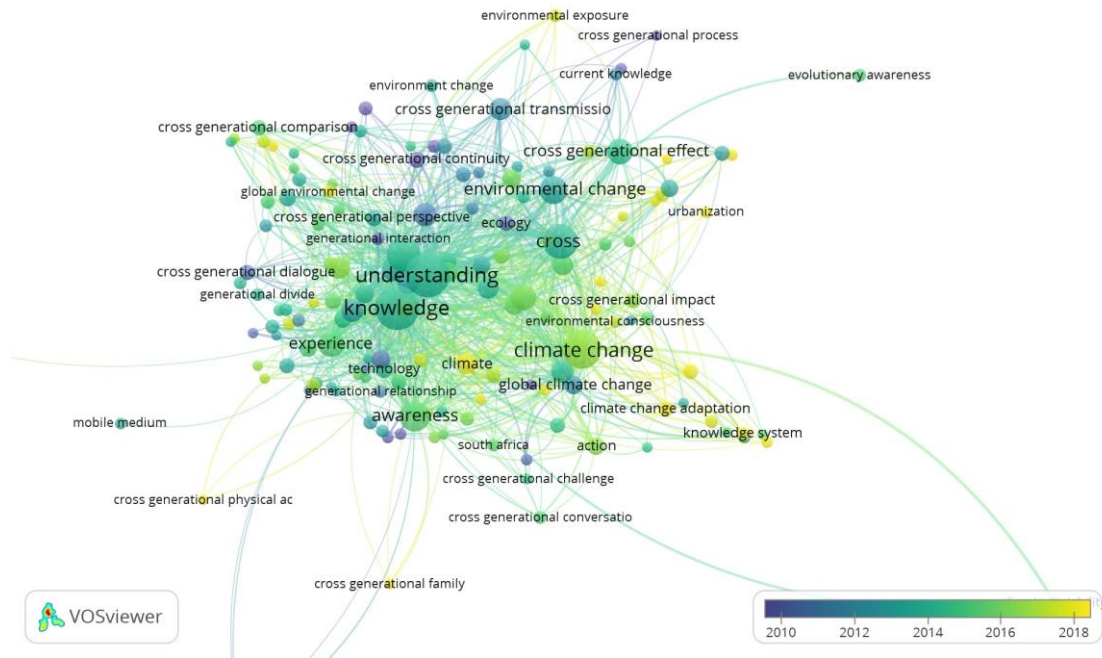


Figure 6. Overlay visualization of climate change and cross-generational awareness on VOS viewer (Ibrahim et al., 2024).

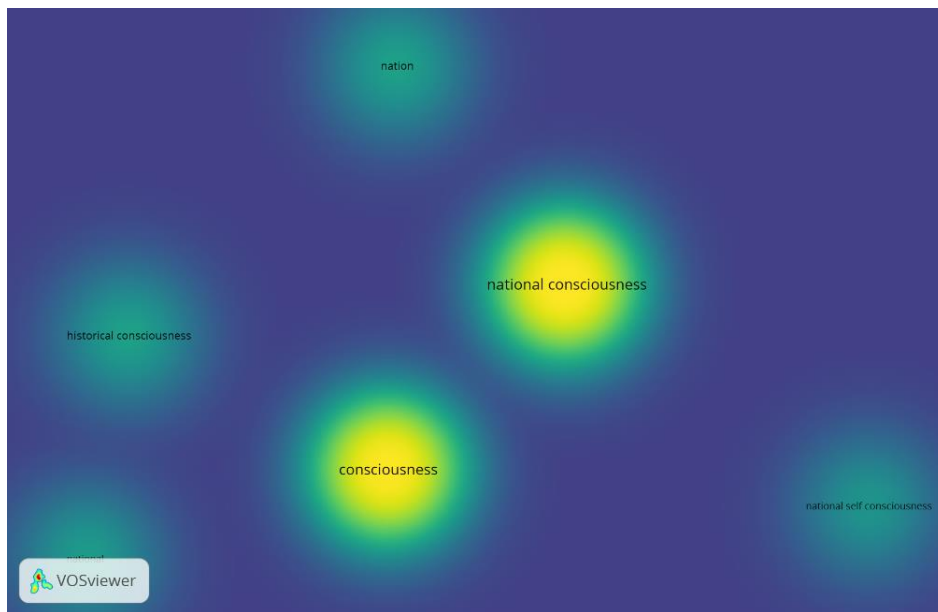


Figure 7. Overlay visualization of national consciousness on VOS viewer.

5. CONCLUSION

The main focus continues to shift from the goal of state resilience in the concern of the Natuna Islands where conflicts between countries often occur to a social perspective in the study of the national consciousness of the Gen-Z over the previous several decades. There is a significant difference in the national awareness of the Gen-Z who do not use the Natuna game which has good results compared to the national awareness of the Gen-Z who do not use the Natuna game and the need for action to reduce the factors causing the lack of love for the homeland and defending the country. It is recommended for further research to develop the Natuna game more widely and increase the sense of national awareness.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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