

Growing Maritime Activity in the Arctic and Its Implications for NATO Security

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Abstract

Growing maritime activity, climate driven changes, and geopolitical competition are increasing the strategic importance of the Arctic and raising new security concerns for NATO. This study examines how defence and security professionals in Lithuania perceive Arctic geopolitical risks, NATO maritime preparedness, regional threats, and future security scenarios. A quantitative survey was conducted using a five point Likert scale. Data were analysed using descriptive statistics, Spearman rank correlation, the Kruskal Wallis test, and K-Means cluster analysis. Three distinct respondent opinion clusters were identified: Manageable Situation, Lowest Perceived Threat, and Growing Threat. The results showed that stronger perceptions of geopolitical competition were associated with higher perceived escalation risk. Perceived Russian threat was positively associated with support for increased NATO investment in long term Arctic capabilities. In contrast, assessments of NATO preparedness and respondents' professional experience were not significantly associated with perceived escalation risk. The findings indicate that support for stronger NATO engagement in the Arctic is mainly shaped by perceptions of specific security threats rather than general assessments of NATO capabilities. The study supports continued attention to long term maritime capability development, regional cooperation, and changing Arctic security conditions.

KEY WORDS: *Arctic security; NATO; maritime strategy; geopolitical competition; threat perception; Arctic maritime activity; K means cluster analysis; defence professionals.*

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1. Introduction

The Arctic is changing from a region traditionally associated with environmental research and limited maritime access into an area of growing economic, political, and security importance. Climate change and declining sea ice are creating longer periods of maritime activity and increasing interest in Arctic shipping routes, including the Northern Sea Route. Recent research confirms that climate driven sea ice loss is expanding access to shorter maritime routes and changing patterns of global shipping [1,2]. At the same time, greater maritime access creates new security concerns related to control of sea lines of communication, critical infrastructure, natural resources, and military presence. The growing economic importance of the Arctic is closely linked to its natural resources. Hydrocarbon reserves, rare metals, and critical minerals increase the strategic value of the region. Greenland, in particular, has gained geopolitical importance due to its potential role in the supply of critical minerals needed for energy and technology sectors [3]. Thus, increasing maritime activity cannot be assessed only from an economic perspective. Shipping routes, access to resources, and national security interests are increasingly linked and contribute to wider competition among major powers. [4]

Russia remains a central actor in the Arctic security environment. The development of military infrastructure and the role of the Northern Fleet indicate the continued strategic importance of the Arctic to Russian defence policy [5,6]. Previous studies have shown that Russian military activity in the region combines national defence, nuclear deterrence, maritime control, and protection of the Northern Sea Route [5,7]. The 2024 United States Department of Defense Arctic Strategy also identifies Russian military activity and lower intensity destabilizing actions as major security concerns, while China's growing interest in Arctic access and resources adds another factor to regional competition [8,9]. These developments have direct implications for NATO. The Alliance must consider maritime security, deterrence, critical infrastructure

protection, military mobility, and cooperation with Nordic countries. However, two different interpretations of Arctic security remain present in current research. One view considers increasing military activity and geopolitical competition as signs of growing security risk and possible escalation [5,8]. Another view stresses that Arctic security should not be understood only through military confrontation, since international law, regional cooperation, and practical governance mechanisms may continue to limit conflict [10]. This difference raises an important research question concerning how security professionals perceive current Arctic risks and whether stronger threat perceptions are associated with greater support for NATO capability development.

Although Arctic security has received increasing academic and political attention, limited quantitative evidence exists on how Lithuanian defence and security professionals assess Arctic geopolitical competition, NATO maritime preparedness, military and hybrid threats, and future security scenarios. This study addresses this gap by examining respondents' opinions using a quantitative survey and statistical analysis. The main objective is to assess whether growing maritime activity and geopolitical competition in the Arctic are perceived as threats to NATO security interests and how these perceptions are associated with evaluations of NATO maritime capabilities and support for long term investment in the region [11].

2. Study Methodology

The methodological approach was developed to examine how Lithuanian defence and security professionals perceive the implications of growing maritime activity and geopolitical competition in the Arctic for NATO security. The empirical study focused on perceptions of the Arctic's geopolitical importance, NATO maritime preparedness, military and hybrid threats, conflict escalation, and future NATO capability requirements. The research model assumed that perceptions of geopolitical competition and NATO preparedness are related to threat perception and, in turn, to support for NATO investment and action in the Arctic.

2.1. Research Design

A quantitative, cross sectional pilot research design was applied. The quantitative approach was selected because the study aimed to measure respondents' levels of agreement with predefined statements, examine associations between selected variables, compare professional experience groups, and identify distinct patterns of respondent opinions. Based on the research problem, objectives, and operationalized variables, four research hypotheses were formulated as testable statements:

- H1. Stronger agreement that the Arctic is becoming an arena of increasing geopolitical competition is associated with a higher perceived likelihood of conflict escalation in the Arctic.
- H2. A higher perceived level of threat posed by Russia in the Arctic is associated with stronger support for increased NATO investment in long term Arctic capabilities.
- H3. Lower assessments of NATO preparedness and capabilities in the Arctic are associated with a higher perceived likelihood of conflict escalation in the region.
- H4. Respondents with greater professional experience in the defence and security sector demonstrate higher levels of perceived threat regarding the Arctic region.

The hypotheses specify the expected direction of relationships between the analysed variables and provide a clear basis for statistical testing. Accordingly, the research design combined descriptive analysis, correlational analysis, nonparametric group comparison, and cluster analysis to examine both variable relationships and distinct respondent opinion profiles.

2.2. Sample and Research Context

Data were collected through an anonymous online questionnaire developed by the author and administered through the *Apklausa.lt* survey platform. Data collection was conducted from September to October 2025 and lasted approximately one month. The questionnaire was not made publicly available. Invitations to participate were distributed through military electronic mail channels to selected groups of defence and security professionals. Participation was voluntary and anonymous. Respondents were informed about the purpose of the study, the anonymous treatment of their responses, and the use of aggregated data for a pilot research study. The questionnaire required approximately five minutes to complete. A total of 43 completed questionnaires were included in the statistical analysis.

The study was conducted in the Lithuanian defence and security context. The pilot sample consisted of respondents employed in or professionally connected with the Lithuanian national defence system. Participants included military and civilian personnel with professional experience in defence or security. The sample was purposively selected to obtain informed assessments from respondents familiar with defence and security issues. The sample was characterized by a high level of education and extensive professional experience. Eighty-six percent of respondents held a bachelor's or master's degree, while 84 percent reported 15 or more years of professional experience in the defence sector. Given the sample size and its professional structure, the study was defined as a pilot quantitative study. The sample was not intended to be statistically representative of the Lithuanian population. Rather, it was used to assess the empirical research model and examine patterns of opinion among respondents with substantial defence and security experience.

2.3. Measurement of Variables

The questionnaire was developed according to the operational model of the study. It consisted of five sections. Section I measured demographic and professional characteristics. Section II measured Perceived Geopolitical Risk in the Arctic. Section III assessed NATO Maritime Strategy and preparedness. Section IV measured Perceived Challenges and Threats. Section V assessed Future Scenarios and support for NATO action in the Arctic. The substantive variables in Sections II to V were measured using a five point Likert scale, where 1 represented strongly disagree, 2 disagree, 3 neither agree nor disagree, 4 agree, and 5 strongly agree. Higher values therefore indicated stronger agreement with the respective statement. The main dependent variable was respondents' agreement with the statement that NATO should invest more actively in long term capabilities in the Arctic, measured by ZV.5.

The internal consistency of the four research constructs was assessed using Cronbach's alpha [12]. The coefficients ranged from 0.678 for Perceived Geopolitical Risk in the Arctic to 0.808 for Future Scenarios. The NATO Maritime Strategy construct produced an alpha coefficient of 0.714, while Perceived Challenges and Threats reached 0.746. Sampling adequacy was assessed using the Kaiser Meyer Olkin measure, with values ranging from 0.636 to 0.740. Bartlett's test of sphericity was statistically significant for all constructs at $p < 0.001$. These results provided acceptable empirical support for the internal consistency and construct structure of the questionnaire.

2.4. Data Analysis

Statistical analysis was performed using IBM SPSS v30. First, descriptive statistics were calculated to summarize the main characteristics of the variables. The number of observations, minimum and maximum values, means, and standard deviations were examined to assess the general direction and variation of respondents' answers. Because the main variables were measured using an ordinal Likert scale and the sample was relatively small, nonparametric statistical methods were used for hypothesis testing [13–15]. Spearman's rank correlation coefficient was applied to test H1 to H3 and assess associations between geopolitical competition, Russian threat perception, NATO preparedness, regional cooperation, escalation risk, and support for NATO capability investment. The Kruskal Wallis test was used to test H4 by comparing threat and escalation perceptions across three professional experience groups.

In addition, K-means cluster analysis [16] was applied to identify distinct respondent opinion profiles based on standardized variables from Sections II to V. Standardized Z scores were used to make variables directly comparable and to identify whether each cluster showed above or below sample average agreement with the analysed statements. The clustering procedure produced three respondent opinion clusters, subsequently interpreted as Manageable Situation, Lowest Perceived Threat, and Growing Threat. The K-means solution converged after four iterations. Analysis of variance was used descriptively to identify variables contributing most strongly to cluster separation [17,18]. Since clusters were formed to maximize between cluster differences, the associated ANOVA significance values were interpreted only as descriptive indicators and not as independent hypothesis tests.

3. Results

Following the analysis, three distinct clusters of respondents' perceived opinions were identified. Based on the patterns of respondents' assessments of Arctic security threats and geopolitical developments, the clusters were named Cluster 1, "Manageable Situation"; Cluster 2, "Lowest Perceived Threat"; and Cluster 3, "Growing Threat". These clusters represent three different patterns of respondents' opinions regarding the security situation in the Arctic and its implications for NATO. The K means clustering model stabilized after four iterations. The iteration history presented in Table 1 shows the changes in cluster centres at each stage of the clustering process.

Table 1. The changes in cluster centres at each stage of the clustering process

Iteration ^a	Change in Cluster Centers		
	Cluster 1 Manageable Situation	Cluster 2 Lowest Perceived Threat	Cluster 3 Growing Threat
1	4,163	0,000	3,955
2	0,147	0,000	0,156
3	0,163	0,000	0,180
4	0,000	0,000	0,000

Notes: ^a: Convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center is 0,000. The current iteration is 4. The minimum distance between initial centers is 10,311.

During the first iteration, substantial changes were recorded in the centres of Cluster 1 and Cluster 3, reaching 4.163 and 3.955, respectively, whereas no change was observed for Cluster 2. This indicates that the initial respondent allocation was mainly adjusted within the Growing Threat and Lowest Perceived Threat clusters. During the second iteration, changes

in the cluster centres decreased considerably to 0.147 for Cluster 1 and 0.156 for Cluster 3. In the third iteration, only minor changes were recorded, reaching 0.163 and 0.180, respectively. Cluster 2 remained unchanged throughout all iterations, indicating a stable centre for respondents who perceived the Arctic security situation as manageable. The clustering process converged at the fourth iteration, when the maximum absolute coordinate change in all cluster centres was 0.000. The minimum distance between the initial cluster centres was 10.311. The absence of further changes indicates that a stable three cluster solution was reached.

The results therefore indicate the presence of three distinct perceived opinion clusters among respondents. The identified cluster structure reflects different patterns in respondents' assessment of Arctic security developments, ranging from the perception of a growing security threat, through a manageable security situation, to the lowest level of perceived threat. The iteration pattern therefore supports the statistical stability of the selected K means model. The largest adjustment occurred during the initial stage of clustering, followed by only minor changes in subsequent iterations and complete convergence at iteration four. The resulting cluster structure allows respondents to be grouped according to different levels of perceived Arctic security threat, ranging from a growing threat assessment to a comparatively low perception of security risks.

The ANOVA results with effect sizes are presented in Table 2. Eta squared values were calculated to assess the magnitude of differences between the three perceived opinion clusters.

Table 2. ANOVA results with effect sizes

Variable	Cluster	Error	F	Sig.	η^2
	Mean Square	df	Mean Square	df	
ZII.1	2.954	2	0.902	40	3.274 0.048 0.141
ZII.3	6.414	2	0.729	40	8.796 0.001 0.305
ZII.4	8.156	2	0.642	40	12.699 <0.001 0.388
ZII.5	5.326	2	0.784	40	6.795 0.003 0.254
ZIII.1	3.210	2	0.889	40	3.609 0.036 0.153
ZIII.2	6.386	2	0.731	40	8.739 0.001 0.304
ZIII.3	5.390	2	0.781	40	6.905 0.003 0.257
ZIII.4	7.842	2	0.658	40	11.920 <0.001 0.373
ZIII.5	11.807	2	0.460	40	25.685 <0.001 0.562
ZIV.1	11.480	2	0.476	40	24.116 <0.001 0.547
ZIV.2	5.167	2	0.792	40	6.527 0.004 0.246
ZIV.3	8.850	2	0.607	40	14.568 <0.001 0.421
ZIV.4	4.774	2	0.811	40	5.885 0.006 0.227
ZIV.5	7.399	2	0.680	40	10.880 <0.001 0.352
ZV.1	7.066	2	0.697	40	10.143 <0.001 0.336
ZV.2	6.395	2	0.730	40	8.757 0.001 0.305
ZV.3	10.007	2	0.550	40	18.207 <0.001 0.477
ZV.4	6.483	2	0.726	40	8.931 0.001 0.309
ZV.5	10.021	2	0.549	40	18.256 <0.001 0.477

Notes: variables are standardized using z-scores. Effect sizes are measured by η^2 (eta squared).

The ANOVA results indicate notable differences between the three perceived opinion clusters across all variables included in the K means cluster model. The largest effects were observed for ZIII.5, $\eta^2 = 0.562$, and ZIV.1, $\eta^2 = 0.547$. This indicates that the respondents' assessment of NATO cooperation with the Nordic countries and their perception of Russia as a direct threat to NATO were among the strongest variables separating the three opinion clusters. Large effects were also identified for ZV.3 and ZV.5, both $\eta^2 = 0.477$, and ZIV.3, $\eta^2 = 0.421$. These results suggest that perceptions of future Arctic security developments, support for NATO's long term capability investments, and assessments of hybrid threats played an important role in the formation of the three respondent opinion profiles. ZII.4 also showed a relatively strong effect, $\eta^2 = 0.388$, indicating that views related to geopolitical competition in the Arctic contributed to cluster differentiation. The remaining variables produced effect sizes ranging from $\eta^2 = 0.141$ to $\eta^2 = 0.373$. The smallest effect was observed for ZII.1, $\eta^2 = 0.141$, followed by ZIII.1, $\eta^2 = 0.153$. Although these variables contributed less strongly to the separation of the clusters, they remained part of the overall cluster structure. Overall, the effect size results show that the three perceived opinion clusters were differentiated mainly by respondents' assessments of NATO's regional security role, the direct threat posed by Russia, hybrid security risks, and the need for long term NATO capability development in the Arctic. These variables provide the strongest statistical basis for the interpretation of the clusters as Growing Threat, Manageable Situation, and Lowest Perceived Threat.

The F statistics and significance values are reported for descriptive purposes only. Since the K means clustering procedure forms clusters by maximizing differences between cases assigned to different groups, the observed significance levels cannot be interpreted as independent hypothesis tests of equal cluster means. Therefore, greater interpretative weight

was given to the relative F values and eta squared effect sizes when identifying the variables that contributed most strongly to the separation of the three perceived opinion clusters.

The final cluster centers were calculated as the average standardized score for each variable within each cluster. Table 3 reflects the characteristics of each cluster and shows clear differences in respondents' perceived opinions regarding Arctic geopolitical developments, NATO maritime preparedness, security threats, and future security scenarios.

Table 3. Final cluster centers.

Variable	Cluster 1 Manageable Situation	Cluster 2 Lowest Perceived Threat	Cluster 3 Growing Threat
Perceived Geopolitical Risk in Arctic			
ZII.1	-0.191	-1.813	0.301
ZII.3	-0.520	-0.234	0.584
ZII.4	-0.595	0.029	0.653
ZII.5	-0.482	0.099	0.526
NATO Maritime Strategy			
ZIII.1	-0.347	-0.613	0.412
ZIII.2	-0.532	0.608	0.555
ZIII.3	-0.240	-2.542	0.391
ZIII.4	-0.250	-3.237	0.437
ZIII.5	-0.231	-4.253	0.466
Perceived Challenges and Threats			
ZIV.1	-0.286	-3.984	0.514
ZIV.2	-0.105	-2.950	0.264
ZIV.3	-0.263	-3.453	0.461
ZIV.4	0.032	-3.042	0.117
ZIV.5	-0.380	-2.410	0.539
Future Scenarios			
ZV.1	-0.211	-3.177	0.391
ZV.2	-0.224	-2.933	0.393
ZV.3	-0.119	-4.171	0.340
ZV.4	-0.097	-3.354	0.275
ZV.5	-0.291	-3.627	0.501

Since standardized Z scores were used in the cluster analysis, a positive cluster center indicates that the mean assessment of respondents in a given cluster was above the total sample mean. In contrast, a negative value indicates an assessment below the total sample mean. Values close to zero represent opinions relatively close to the overall average. The direction and magnitude of the standardized cluster centers therefore allow the three respondent opinion profiles to be interpreted.

Cluster 1 was identified as the Manageable Situation cluster. The standardized scores for this group were generally moderately negative and relatively close to zero. The values ranged mainly from -0.595 to 0.032. This pattern indicates that respondents assigned to Cluster 1 tended to assess Arctic geopolitical competition, NATO security challenges, and future risks somewhat below the overall sample average. However, their assessments were not extremely negative. Within the geopolitical dimension, Cluster 1 recorded negative standardized scores for ZII.3, ZII.4, and ZII.5, ranging from -0.482 to -0.595. This suggests that these respondents recognized the increasing geopolitical role of the Arctic but expressed lower levels of concern than respondents in the Growing Threat cluster. A similar pattern was found in the NATO maritime strategy variables. Scores for ZIII.1 to ZIII.5 remained below the sample average, with values between -0.532 and -0.231. Thus, the respondents in this cluster did not express particularly strong assessments of either NATO preparedness or regional security concerns. The threat and escalation variables further support the interpretation of Cluster 1 as Manageable Situation. The standardized score for the perceived direct Russian threat, ZIV.1, was -0.286, while the score for the likelihood of conflict escalation, ZIV.5, was -0.380. These values indicate lower than average threat perception, but they are considerably closer to the sample mean than the corresponding values in Cluster 2. The near zero value for ZIV.4, at 0.032, also indicates an assessment almost identical to the overall sample average. The future scenario variables followed the same pattern, with scores ranging from -0.291 to -0.097. Therefore, Cluster 1 represents respondents who appear to recognize Arctic security problems but assess the current situation as relatively manageable.

Cluster 2 was identified as the Lowest Perceived Threat cluster. This cluster is statistically distinct because of its strongly negative standardized scores across most variables. The most negative cluster centers were recorded for ZIII.5 at -4.253, ZV.3 at -4.171, ZIV.1 at -3.984, and ZV.5 at -3.627. These values are far below the total sample mean and indicate a very different opinion profile compared with the other two clusters. The threat variables provide particularly strong evidence for this interpretation. The standardized score for ZIV.1 was -3.984, indicating a substantially lower perception of Russia as a direct security threat to NATO in the Arctic. Similarly, ZIV.2, ZIV.3, and ZIV.4 produced scores of -2.950, -3.453, and -

3.042, respectively. The assessment of near term conflict escalation, ZIV.5, was also low at -2.410. Taken together, these values show that Cluster 2 respondents consistently perceived Arctic military, hybrid, and escalation risks at levels well below the sample average. A similar opinion pattern was observed in relation to NATO and future security scenarios. Very low standardized scores for ZIII.3, ZIII.4, and ZIII.5 indicate that this cluster differed strongly from the other groups in its assessment of NATO related security issues and regional cooperation. The score of -4.253 for ZIII.5 represents the strongest negative deviation among the NATO variables. In the future scenario dimension, all five variables were strongly negative, ranging from -2.933 to -4.171. The value of ZV.5, which measures support for greater long term NATO capability investment in the Arctic, was -3.627. This suggests very limited support for stronger NATO investment compared with the overall sample. One notable result for Cluster 2 is the positive standardized score for ZIII.2 at 0.608. This variable concerns the assessment of NATO maritime forces' ability to ensure security in the Arctic. The positive value indicates that, despite their low threat perception, these respondents assessed NATO maritime capabilities more positively than the average respondent. This finding is important for the interpretation of the cluster. The low level of perceived threat may be associated not only with a reduced assessment of Arctic risks but also with relatively greater confidence in NATO's current maritime capabilities. Therefore, the label Lowest Perceived Threat more accurately describes this group than terms such as ignorant or careless, which would introduce a subjective judgement that is not supported by the statistical data.

Cluster 3 was identified as the Growing Threat cluster. Unlike Clusters 1 and 2, Cluster 3 showed positive standardized scores for every variable included in the cluster analysis. The scores ranged from 0.117 to 0.653, indicating consistently above average assessments across geopolitical, NATO, threat, escalation, and future scenario dimensions. The highest standardized scores for Cluster 3 were observed for ZII.4 at 0.653, ZII.3 at 0.584, and ZIII.2 at 0.555. These results indicate a strong perception of the increasing geopolitical importance of the Arctic and a high level of engagement with issues related to NATO maritime security. The positive scores across all variables in the geopolitical dimension show that respondents in this cluster assessed Arctic competition and regional changes more strongly than the sample average. The threat perception variables also clearly distinguish Cluster 3. The score for ZIV.1 was 0.514, indicating an above average perception of Russia as a direct threat to NATO. The score for conflict escalation, ZIV.5, reached 0.539, which was the highest standardized assessment of escalation among the three clusters. Hybrid and other security threats were also assessed above the sample average, as shown by the positive scores for ZIV.2, ZIV.3, and ZIV.4. The future scenario variables provide further support for the Growing Threat profile. All five standardized scores were positive, with ZV.5 reaching 0.501. This indicates greater than average support for active NATO investment in long term Arctic capabilities. Positive scores for ZV.1 to ZV.4 also suggest that these respondents were more concerned about future Arctic security developments and more supportive of NATO action in the region.

Comparison of the final cluster centers shows three clearly different patterns of respondents' perceived opinions. Cluster 1 represents a moderate assessment in which Arctic risks are recognized but the security situation is perceived as manageable. Cluster 2 represents the lowest level of perceived threat, characterized by strongly negative assessments of military, hybrid, and escalation risks and low support for increased NATO investment. Cluster 3 represents the strongest perception of a growing threat and combines above average concern regarding geopolitical competition, Russia's actions, conflict escalation, and future Arctic security with greater support for NATO capability development. The strongest separation between the clusters can be observed in variables ZIII.5, ZIV.1, ZV.3, and ZV.5. This result is consistent with the effect size analysis presented in Table 4, where these variables produced some of the highest eta squared values. Thus, respondents' opinions regarding NATO regional security cooperation, the direct threat posed by Russia, future security developments, and long term NATO investment appear to be central factors in distinguishing the three perceived opinion clusters.

Overall, the final cluster centers confirm that the respondent sample was not uniform in its assessment of Arctic security. Instead, three distinct opinion profiles were identified. The main difference between the clusters was not simply whether respondents recognized the Arctic as strategically important, but the degree to which they interpreted current geopolitical and maritime changes as security threats and supported a stronger long term NATO response in the region. The details are presented and discussed below (see Fig.1-Fig. 4).

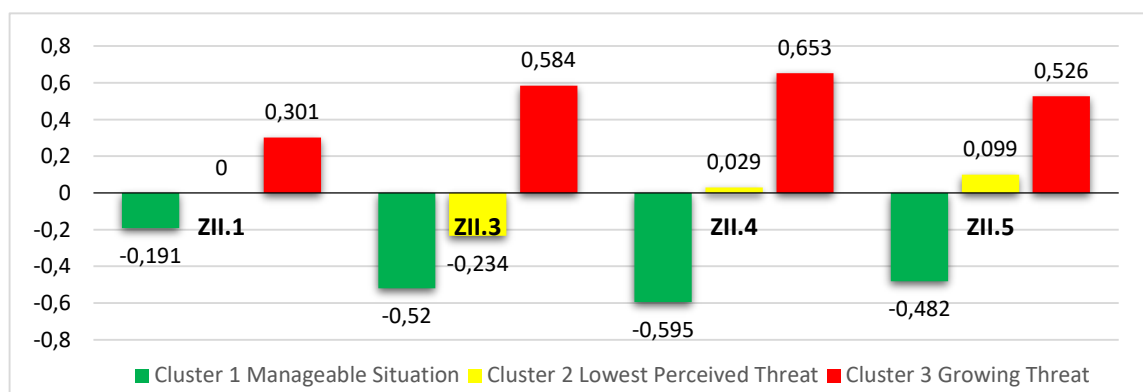


Fig. 1. Clustering according to perceived geopolitical risk in arctic.

The Perceived Geopolitical Risk in the Arctic dimension reveals clear differences among the three respondent clusters (Fig. 1). Cluster 1, Manageable Situation, shows generally below average assessments across ZII.1, ZII.3, ZII.4, and ZII.5, indicating a moderate perception of geopolitical risks. Cluster 2, Lowest Perceived Threat, demonstrates the lowest assessment of the Arctic's growing importance to international security ZII.1, suggesting limited concern about current regional developments. In contrast, Cluster 3, Growing Threat, reports consistently above average scores, particularly regarding major power competition ZII.3 and the geopolitical importance of Arctic energy resources ZII.4. Overall, the results indicate that perceived geopolitical risk is mainly shaped by views on global power competition ZII.3 and strategic resource interests in the Arctic ZII.4.

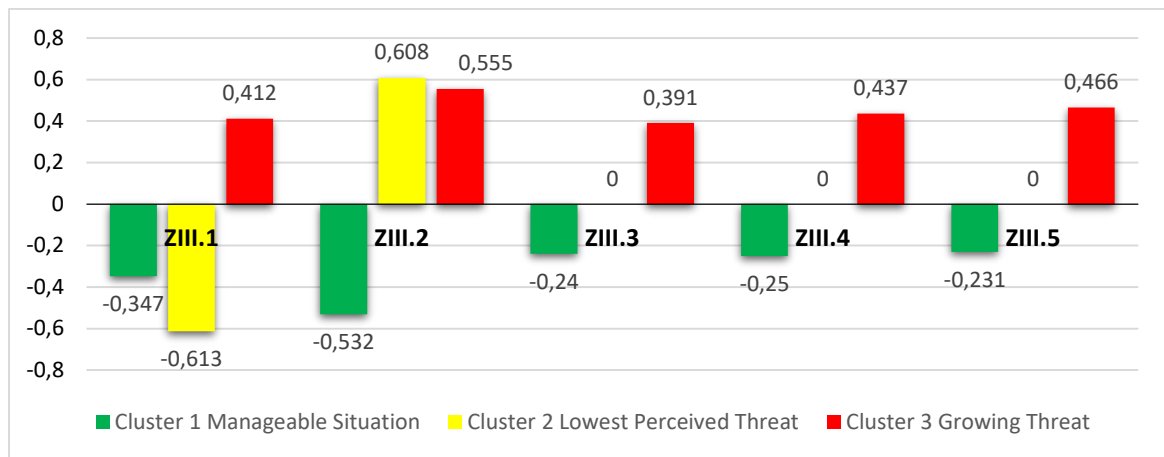


Fig. 2. Clustering according to perceived NATO maritime strategy.

The NATO Maritime Strategy dimension reveals clear differences among the three respondent clusters. Cluster 1, Manageable Situation, shows generally below average assessments across ZIII.1 to ZIII.5, indicating moderate views of NATO's role and maritime preparedness in the Arctic. Cluster 2, Lowest Perceived Threat, reports particularly low assessments of NATO military exercises ZIII.3, strategic dependence on US maritime forces ZIII.4, and cooperation with Nordic countries ZIII.5. However, this cluster shows an above average assessment of NATO maritime capabilities ZIII.2. In contrast, Cluster 3, Growing Threat, demonstrates consistently above average scores across all NATO Maritime Strategy variables, particularly NATO capabilities ZIII.2 and cooperation with Nordic countries ZIII.5. Overall, the results indicate distinct differences in respondents' perceptions of NATO's maritime preparedness, strategic dependence, and regional security cooperation in the Arctic (Fig.2).

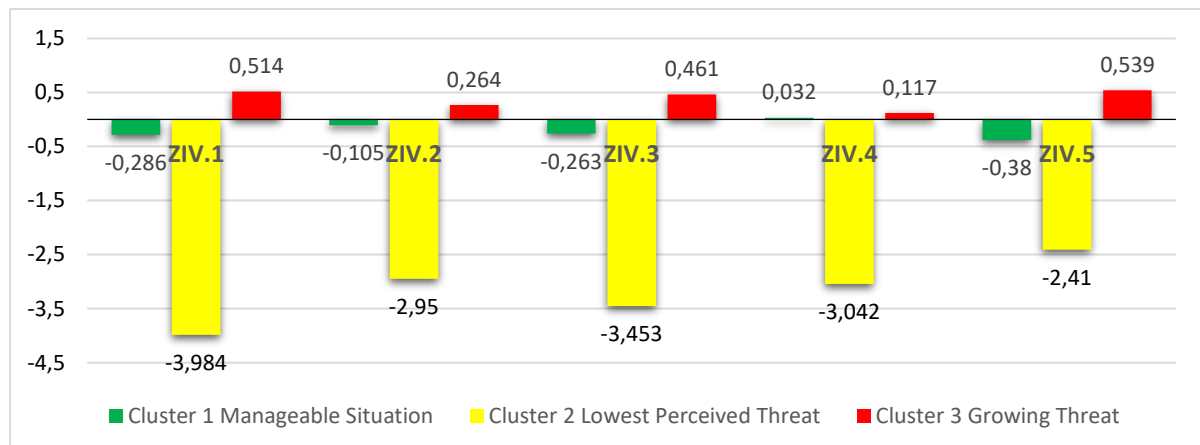


Fig. 3. Clustering according to perceived challenges and threats.

The Perceived Challenges and Threats dimension reveals clear differences among the three respondent clusters. Cluster 1, Manageable Situation, shows generally below average assessments across ZIV.1 to ZIV.5, indicating a moderate perception of Arctic security threats. Cluster 2, Lowest Perceived Threat, reports strongly below average scores, particularly regarding the direct Russian threat ZIV.1, hybrid threats ZIV.3, and insufficient NATO investment ZIV.4, suggesting limited concern about Arctic security risks. In contrast, Cluster 3, Growing Threat, demonstrates consistently above average assessments, particularly for the direct Russian threat ZIV.1, hybrid threats ZIV.3, and the likelihood of conflict escalation ZIV.5. Overall, the results indicate that perceived Arctic security challenges are mainly shaped by assessments of Russia's actions, hybrid threats, and the risk of future conflict escalation (Fig.3).

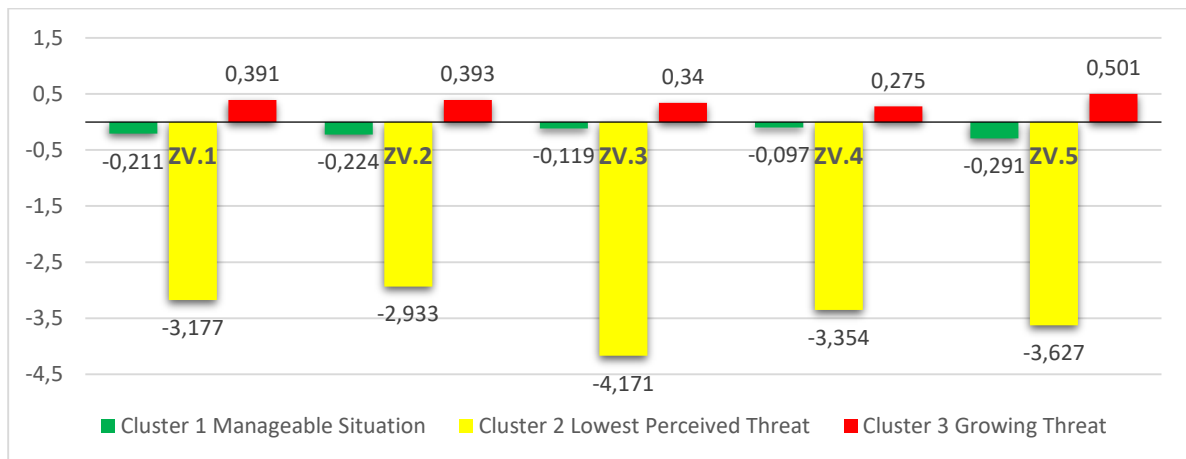


Fig. 4. Clustering according to future scenarios.

The *Future Scenarios* dimension reveals clear differences among the three respondent clusters. Cluster 1, Manageable Situation, shows slightly below average assessments across ZV.1 to ZV.5, indicating moderate expectations regarding future Arctic security developments. Cluster 2, Lowest Perceived Threat, reports strongly below average scores, particularly for cooperation between NATO, the Nordic countries, and the EU ZV.3, climate driven adaptation of NATO's maritime strategy ZV.4, and long term NATO capability investments ZV.5. In contrast, Cluster 3, Growing Threat, demonstrates consistently above average assessments, particularly regarding possible conflict escalation ZV.2 and greater NATO investment in long term Arctic capabilities ZV.5. Overall, the results indicate that future scenario perceptions differ mainly in assessments of security escalation, strategic adaptation, regional cooperation, and the need for stronger NATO capabilities in the Arctic (Fig.4).

4. Discussion

The findings indicate that respondents do not share a uniform perception of Arctic security. The cluster analysis identified three opinion profiles: Manageable Situation, Lowest Perceived Threat, and Growing Threat. Since all statements were assessed using a five point Likert scale from 1, strongly disagree, to 5, strongly agree, the cluster centres represent differences in the level of agreement with the research statements relative to the overall sample mean.

The results are consistent with previous research describing the Arctic as an increasingly important area of geopolitical competition. The Growing Threat cluster showed above average agreement that the Arctic is becoming an arena of competition among major global powers ZII.3 and that Arctic energy resources have major geopolitical importance ZII.4. These findings correspond with Nuttall [3], who emphasizes the geopolitical importance of Arctic critical minerals, and with the United States Department of Defense 2024 [8], which identifies increasing strategic competition as a major factor affecting Arctic security. Thus, perceived geopolitical risk appears to be strongly linked to competition for strategic influence, maritime access, and natural resources.

The findings also support H1. A statistically significant positive relationship was identified between the perception of the Arctic as an arena of global power competition ZII.3 and the perceived likelihood of conflict escalation ZIV.5. Although the relationship was weak, the result suggests that stronger agreement with increasing geopolitical competition is associated with greater concern about possible escalation. This supports previous arguments that increasing economic and military activity may create additional sources of tension in the Arctic [7].

Russia emerged as the most important factor shaping respondents' threat perceptions. The Growing Threat cluster demonstrated above average agreement that Russian actions in the Arctic pose a direct threat to NATO ZIV.1. In contrast, the Lowest Perceived Threat cluster showed very low agreement with this statement. H2 was supported by a statistically significant positive relationship between the perceived Russian threat ZIV.1 and support for greater NATO investment in long term Arctic capabilities ZV.5. This finding is consistent with Kjellén [5] and the United States Department of Defense 2024 [8], which identify Russian military infrastructure and Northern Fleet activities as important elements of the Arctic security environment.

H3 was not supported, as NATO preparedness ZIII.2 and cooperation with Nordic countries ZIII.5 were not significantly related to the perceived likelihood of escalation ZIV.5. This suggests that respondents may assess NATO capabilities and escalation risk as separate security issues. Perceptions of escalation may therefore be more strongly shaped by the actions of external actors than by assessments of NATO's current maritime capabilities [19].

Similarly, H4 was not supported. Professional experience was not significantly associated with perceptions of the Russian threat ZIV.1 or conflict escalation ZIV.5. This result may be related to the structure of the pilot sample, as most respondents had extensive defence sector experience. Limited differences between professional experience groups may have reduced variation in respondents' opinions.

Overall, the results suggest that support for stronger NATO engagement in the Arctic is mainly associated with the perception of specific security threats, particularly Russian actions and hybrid threats, rather than with general assessments of NATO preparedness. [20] Future studies should include larger and more balanced samples from different NATO member states and Nordic countries. Comparative and longitudinal research could also assess whether changes in Arctic shipping, military activity, and NATO presence affect threat perceptions and support for long term capability development.

Practical Implications. The findings provide several practical implications for NATO security planning in the Arctic. First, the strong relationship between the perceived Russian threat ZIV.1 and support for long term NATO capability investment ZV.5 indicates that NATO planning should be based on clearly identified security risks. Strategic communication should explain how Russian military activity, maritime infrastructure, and hybrid actions may affect NATO security interests and maritime operations in the Arctic.

Second, the results support continued investment in long term Arctic maritime capabilities [11,21]. Rather than focusing only on the possibility of immediate military escalation, NATO should strengthen maritime surveillance, situational awareness, logistics, cold weather operational capabilities, and the protection of critical underwater infrastructure. Growing maritime activity and changing environmental conditions require sustained preparedness and regular assessment of regional risks.

Third, cooperation with Nordic countries should remain an important part of NATO's Arctic security policy. Joint military exercises, intelligence sharing, maritime monitoring, and coordinated search and rescue procedures could improve practical readiness. The results related to ZIII.5 also indicate that respondents differ considerably in their agreement regarding the security benefits of such cooperation. Therefore, NATO should provide clearer evidence of how regional cooperation contributes to operational security.

Limitations. This study has several limitations. First, the small pilot sample limits the generalizability of the findings. Second, most participants had extensive professional experience in the defence sector, resulting in an uneven distribution across experience groups. Third, the use of a self-reported Likert scale survey reflects respondents' perceptions rather than objective security conditions. Finally, the K means cluster solution is specific to the analysed sample and should be confirmed using larger and more diverse samples in future research.

5. Conclusions

The study identified three distinct respondent opinion clusters regarding Arctic security: Manageable Situation, Lowest Perceived Threat, and Growing Threat. The findings show that perceptions of Arctic security differ mainly according to the level of agreement with statements concerning major power competition, Russian actions, hybrid threats, and future conflict escalation.

The results confirmed that stronger perceptions of geopolitical competition are associated with higher perceived escalation risk. Moreover, the perceived Russian threat was positively associated with support for increased NATO investment in long term Arctic capabilities. In contrast, assessments of NATO preparedness and respondents' professional experience were not significantly associated with perceived escalation risk.

Overall, the findings suggest that support for stronger NATO engagement in the Arctic is mainly shaped by perceptions of specific security threats rather than general assessments of NATO capabilities. The results support long term maritime capability development, stronger regional cooperation, and continued assessment of changing security conditions in the Arctic.

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