A weighted linear combination-based multi-criteria framework for prioritizing environmental monitoring sites in coastal military areas of the Mekong Delta, Vietnam

Nguyen Thi Anh Huy, Dang Yen Nhi, Do Nguyen Hoang Nga, Le Anh Kien*

Institute for Tropical Technology (VITTEP), Academy of Military Science and Technology, 57A Truong Quoc Dung, Phu Nhuan, Ho Chi Minh City, Vietnam.

*Corresponding author: leanhkien@vittep.com

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ABSTRACT

Coastal military areas in the Mekong Delta are increasingly exposed to environmental pressures from salinity intrusion, climate change, and combined military-civilian pollution sources. However, most environmental monitoring frameworks are designed for civilian contexts and rarely consider the operational characteristics of military facilities. This study proposes a Weighted Linear Combination (WLC)-based multi-criteria decision framework to prioritize environmental monitoring sites in coastal military units of Vinh Long Province (formerly Tra Vinh Province), Vietnam. Six criteria including environmental baseline characteristics, pollutant accumulation potential, representativeness, impact on military/defense activities, accessibility and operatability, and ecological-social sensitivity were integrated and weighted separately for soil, surface water, and groundwater. A total of 346 candidate locations across 22 military bases were evaluated using field surveys, environmental datasets, and spatial analysis. The model identified 286 priority sites (82.6%) for monitoring, including 110 surface water, 110 groundwater, and 66 soil locations, with higher priority scores concentrated in technical and production units associated with greater pollution risk. Unlike conventional WLC applications, the proposed framework incorporates military-operational sensitivity and medium-specific weighting, enabling more realistic prioritization of monitoring sites in defense-managed environments. The approach provides a transparent and transferable tool for optimizing environmental monitoring networks in military-controlled coastal regions.

Keywords: Multi-criteria decision making; Weighted linear combination; Environmental monitoring; Military areas.

1. INTRODUCTION

Coastal regions are highly vulnerable to environmental degradation due to climate change, sea-level rise, saltwater intrusion, and increasing human activities [1]. In the Mekong Delta (Vietnam), these pressures are intensified by dense river networks, low-lying terrain, and rapidly expanding urban, agricultural, and aquaculture development. Consequently, surface water, groundwater, and soil are increasingly threatened by salinization, acidification, and contamination from domestic, industrial, and agricultural sources [2]. Effective environmental monitoring is therefore essential for sustainable resource management and public health protection in these sensitive areas.

In recent decades, many studies have examined environmental degradation and water quality changes in the Mekong Delta, particularly related to saltwater intrusion, acid sulfate soils, and organic pollution in surface waters [3]. However, most monitoring frameworks target civilian or municipal settings and rarely account for the specific characteristics of military zones. Military facilities may generate distinct pollution sources, including heavy metals from ammunition storage and training, petroleum hydrocarbons and solvents from equipment maintenance, and medical and domestic waste from centralized living systems [4]. In addition, military facilities contain operationally sensitive zones such as ammunition depots, fuel storage areas, maintenance workshops, and training grounds. Environmental degradation in these areas can affect both ecological quality and military readiness. Therefore, monitoring site selection must consider both pollution risks and the operational sensitivity of different functional zones [5].

In coastal military areas, environmental pressures are intensified by urban expansion, industrial development, and intensive aquaculture, which often discharge inadequately treated wastewater into surrounding canals and rivers. This increases the risk of cross-contamination between civilian and military water sources, particularly in regions already affected by saline intrusion. Many coastal military units also depend on shallow groundwater and surface water for daily use, making them highly vulnerable to salinity and pollution. Despite these risks, systematic, science-based frameworks for prioritizing environmental monitoring locations in military zones remain limited, although multi-criteria decision analysis (MCDA) methods have been widely used to support environmental management and spatial decision-making [6]. Recent studies have proposed various approaches to optimize environmental monitoring networks, including numerical modelling combined with Kriging interpolation for identifying priority groundwater monitoring wells in coastal aquifers [7], as well as advanced MCDA techniques such as the Analytic Hierarchy Process (AHP), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), and Analytic Network Process (ANP) for discrete decision-making [8]. However, most applications have focused on civilian environmental contexts, while the use of multi-criteria frameworks for monitoring design in military-controlled areas remains limited. In this study, the Weighted Linear Combination (WLC) method was selected for military environmental zoning due to its simplicity, transparency, and efficiency in aggregating multiple criteria into a single suitability index. WLC performs well even with limited or heterogeneous data and enables rapid evaluation of numerous candidate sites, unlike AHP, which is constrained by complex pairwise comparisons. Its straightforward mathematical structure also allows decision-makers to easily interpret results and adjust criterion weights as operational or environmental conditions change. Moreover, WLC reflects the compensatory nature of military decision-making, where sites with high pollution risk may still be prioritized despite limited accessibility.

Therefore, this study aims to develop a multi-criteria WLC-based framework to prioritize environmental monitoring sites in coastal military areas of the Mekong Delta, with a case study in Vinh Long Province (formerly Tra Vinh Province). By integrating natural, hydrological, socio-environmental, and military-operational factors, the proposed approach seeks to (i) identify high-risk and representative monitoring locations for soil, surface water, and groundwater; (ii) establish a scientifically justified and operationally feasible monitoring network; and (iii) support targeted risk management and environmental protection strategies for coastal defense units under increasing climate and anthropogenic pressures.

2. METHODOLOGY

2.1. Data sources for WLC model construction

Data were collected to provide standardized inputs for the WLC model. A total of 346 candidate monitoring locations across 22 military units were identified based on emission sources, functional zones, and expert consultation. Secondary data, including environmental reports, land-use maps, and hydrological and salinity information, were obtained from governmental and military records to characterize background pollution, ecological sensitivity, and pollutant transport potential. Field surveys were conducted to verify the data and collect site-specific information on pollution sources, accessibility, and operational activities. Geographic coordinates and observations were recorded to ensure data reliability, and the standardized dataset was used for WLC-based scoring and prioritization [9-12].

2.2. Method for developing criteria to select sampling locations

The selection of environmental sampling locations in military areas cannot be random or based solely on subjective experience. Inappropriate sampling points may generate data that do not accurately reflect actual pollution conditions, leading to biased assessments of health risks and the effectiveness of treatment solutions. Therefore, this study applies a criteria-based approach to standardize the selection of monitoring sites.

2.2.1. Theoretical basis: the Weighted Linear Combination (WLC) model

To integrate multiple environmental and operational factors into a single evaluation index, a linear weighted model based on the Weighted Sum Model (WSM) was applied [13]. This multi-criteria approach is widely used in environmental studies due to its simplicity and effectiveness in aggregating heterogeneous variables [13,14]. The resulting composite score (S_i) was used to rank and prioritize candidate monitoring sites, where higher values indicate greater suitability [14,15].

The suitability score for each site was calculated as:

$$S_i = \sum_{j=1}^{6} w_j \cdot C_{ji} \quad (1)$$

where S_i is the composite suitability score of site i; C_{ji} is the normalized value of the jth criterion at site i; and w_j is the weight of criterion j, satisfying $\sum w_j = 1$.

2.2.2. System of component criteria and evaluation scales

Based on the characteristics of the 22 military sites in Vinh Long Province (formerly Tra Vinh Province), the criteria framework comprises six component criteria (C_1-C_6). Each criterion is evaluated using a quantitative scoring scale from 1 to 5. The six criteria were adapted from previous studies by Trinh Le [16] and Rausand and Haugen [17].

Table 1. *Criteria system for selecting environmental sampling locations.*

Criterion	Meaning	Scoring scale
Environmental baseline characteristics (C1)	Evaluates the baseline environmental condition of a location and its suitability as a reference for detecting pollution-related changes.	**1** = Disturbed environment with unclear baseline **3** = Moderately defined baseline condition **5** = Stable baseline suitable for monitoring reference
Pollutant accumulation potential (C2)	Considers low-lying areas, flooded zones, or flow convergence points where pollutants are likely to accumulate.	**1** = No accumulation potential **3** = Local accumulation signs **5** = Typical hotspot, high accumulation risk
Representativeness of the area (C3)	Evaluates how well the site reflects the general environmental characteristics of the unit/area.	**1** = Local, not representative **3** = Partially representative **5** = Typical site, clearly representative of the whole area
Impact on military/defense activities (C4)	Assesses the impact of pollution on troop health, infrastructure, equipment, and training.	**1** = Negligible impact **3** = Moderate, indirect impact **5** = Direct, severe impact (e.g., drinking water, warehouses, critical facilities)

Criterion	Meaning	Scoring scale
Accessibility and operability (C5)	Evaluates the convenience and safety of accessing and collecting samples.	**1** = Difficult to access, unsafe **3** = Accessible but limited **5** = Easy to access, safe to operate
Ecological and social sensitivity (C6)	Considers proximity to residential areas, drinking water sources, or ecologically sensitive zones.	**1** = Low or no sensitivity **3** = Moderate sensitivity (affecting part of the population/water sources) **5** = Highly sensitive area, significant risk to humans/ecosystems

In military environments, certain functional zones - such as ammunition depots, fuel storage facilities, maintenance workshops, training grounds, and military medical centers - are more environmentally and operationally sensitive than civilian areas. Contamination in these zones may directly affect troop health, equipment safety, and operational readiness. Therefore, criterion C4 also serves as a proxy for military sensitivity, enabling the model to prioritize monitoring sites in strategically or operationally critical areas.

2.2.3. Determination of weighting coefficients (w_j) for each environmental medium

The weighting coefficients were determined through expert consultation to ensure scientific validity and practical relevance. Three experts from relevant research and management institutions independently assessed the importance of the six criteria (C1-C6) using a five-point scale, and the normalized scores were averaged to obtain the final weights for the WLC model. For each unit, suitability scores were calculated separately by the three experts, with the final suitability score (S_{mean}) reported as the arithmetic mean. The standard deviation (SD) was also calculated to represent variability among expert evaluations and is shown as error bars in the figures.

Because soil, surface water, and groundwater differ in transport behavior and contamination pathways, separate weighting schemes were applied for each environmental medium [15,18]. Weights were assigned based on environmental relevance, operational importance, and data reliability, ensuring balanced representation of risk, feasibility, and sensitivity.

For all media, site suitability was calculated as:

$$S_i = \sum_{j=1}^{6} w_j \cdot C_{ji} \quad (2)$$

Linear weighted function for selecting soil sampling locations

Soil monitoring prioritizes background quality, accumulation potential, and spatial representativeness. The weighting coefficients were:

w_1 = 0.25 (environmental baseline characteristics), w_2 = 0.20 (accumulation potential), w_3 = 0.20 (representativeness), w_4 = 0.15 (military impact), w_5 = 0.10 (accessibility), w_6 = 0.10 (ecological-social sensitivity).

Linear weighted function for selecting surface water sampling locations

Due to dynamic flow and rapid pollutant transport, higher weights were assigned to accumulation potential and military impact. The coefficients were:

w_1 = 0.20 (environmental baseline characteristics), w_2 = 0.25 (hydrodynamic accumulation), w_3 = 0.15 (representativeness), w_4 = 0.20 (military impact and water supply relevance), w_5 = 0.10 (accessibility), w_6 = 0.10 (ecological-social sensitivity: aquaculture and communities).

Linear weighted function for selecting groundwater sampling locations

For groundwater, emphasis was placed on background conditions, transport pathways, representativeness, and military dependence. The coefficients were:

w_1 = 0.25 (environmental baseline characteristics), w_2 = 0.20 (accumulation along groundwater flow), w_3 = 0.20 (representativeness), w_4 = 0.20 (military impact-domestic use and storage facilities), w_5 = 0.10 (accessibility), w_6 = 0.05 (ecological-social sensitivity and community impact).

Based on six evaluation criteria (C1-C6) and field survey data from 22 military units, 346 potential sampling locations were initially assessed. A composite suitability index (S) was calculated for each location using a WLC model, representing the relative monitoring priority of each site.

The composite scores were normalized to a 1-5 scale corresponding to the scoring range of the evaluation criteria. To facilitate interpretation and decision-making in environmental monitoring management, the scores were grouped into three priority levels: (i) Very high priority ($S \geq 4.5$), representing locations with strong evidence of environmental risk and high relevance to military operations; (ii) High priority ($3.5 \leq S < 4.5$), indicating sites with potential pollution sources or strong representativeness; and (iii) Moderate priority ($2.5 \leq S < 3.5$), corresponding to background or relatively low-risk monitoring locations.

3. RESULTS AND DISCUSSION

3.1. Distribution of composite WLC scores across military units

The WLC model was applied to integrate six evaluation criteria into a composite suitability index (S_i) for 22 military units. The resulting scores showed a clear differentiation among sites and across environmental media, confirming the ability of the WLC approach to distinguish between high- and low-priority monitoring locations. The calculation of S_i is expressed as follows:

$$S_i = \sum_{j=1}^{6} w_j \cdot C_{ji} = w_1 C_{1i} + w_2 C_{2i} + w_3 C_{3i} + w_4 C_{4i} + w_5 C_{5i} + w_6 C_{6i} \quad (3)$$

Where: C_{1i} represents the environmental baseline characteristics at site i and its suitability as a reference location for detecting pollution-related changes; C_{2i} indicates the potential for pollutant accumulation (e.g., low-lying areas or flow convergence zones); C_{3i} represents the site's representativeness of the overall area; C_{4i} denotes the degree of impact on military and defense activities; C_{5i} refers to accessibility and operational feasibility; C_{6i} reflects ecological and social sensitivity.

Table 2. *Weighting coefficients (w_j) of criteria for selecting monitoring sites for each environmental medium.*

Evaluation criteria	Weight w_j (Surface water)	Weight w_j (Groundwater)	Weight w_j (Soil)
Environmental baseline characteristics (C1)	0.20	0.20	0.25
Potential for pollutant accumulation (C2)	0.15	0.15	0.20
Representativeness of the whole area (C3)	0.25	0.15	0.20
Impact on military-defense activities (C4)	0.20	0.30	0.15
Accessibility and operational feasibility (C5)	0.10	0.10	0.10
Ecological and social sensitivity (C6)	0.10	0.10	0.10

Table 2 illustrates how the weighting schemes were adjusted for surface water, groundwater, and soil to reflect the specific characteristics of each environmental medium. For surface water, greater emphasis was placed on representativeness (0.25) and environmental baseline characteristics (0.20), underscoring the need to select sites that can capture spatial variation in dynamic aquatic systems. In the case of groundwater, the impact on military-defense activities (0.30) emerged as the most influential factor, indicating that subsurface environments are particularly vulnerable to contamination from operational sources. By contrast, soil assessment was mainly driven by environmental baseline characteristics (0.30) and pollutant accumulation potential (0.20), consistent with the capacity of soil to retain contaminants over long time scales.

As illustrated in figure 1, the composite WLC scores vary substantially among the investigated units. Technical, medical, and logistics units located near estuarine and low-lying zones consistently achieved higher S_i values, whereas administrative and training units situated in inland areas showed lower scores. This pattern demonstrates that environmental risk is not uniformly distributed across the military network but is strongly controlled by both functional land use and hydrogeological setting. This difference can be attributed to the distinct environmental functions and operational activities of these unit types. Technical and logistics units often involve equipment maintenance, fuel storage, material handling, and wastewater discharge, which increase the risk of pollutant release and accumulation. Many of these facilities are also located in low-lying coastal areas where hydrological conditions promote contaminant transport and retention in surface water and shallow aquifers. The composite suitability scores, ranging from approximately 2.5 to 4.7, clearly differentiate low-risk background sites from areas under higher environmental pressure, supporting the selected classification thresholds and confirming the effectiveness of the defined monitoring priority levels.

3.2. Selection of high-priority monitoring locations

Based on the scoring and priority ranking results (S_i), an official monitoring network of 22 sampling stations representing 22 military bases was established. Locations were selected from functional zones with high emission potential and environmental sensitivity within each unit. As shown in table 3, monitoring sites are more densely distributed in technical, production, and logistics units due to their higher pollution risk. After applying the WLC screening to the initial 346 candidate locations, 286 sites were retained for detailed environmental analysis (82.6%), eliminating 60 low-priority locations and reducing the monitoring workload by about 17.3%.

The predominance of surface water and groundwater samples reflects the strong interaction between military facilities and coastal hydrological systems, where canals, ponds, and shallow aquifers serve as key pathways for pollutant transport, especially under saline intrusion and seasonal water scarcity. Prioritizing these compartments enables early detection of environmental risks. The WLC results also show clear differences in environmental risk among unit types, with technical and production units (e.g., repair station, storage company, and Battalion 501) exhibiting higher composite scores than administrative units due to their closer association with pollution sources. This provides a scientific basis for prioritizing sites classified as Very High and High priority for monitoring and management. These units also have higher operational sensitivity, as contamination in repair workshops, ammunition depots, logistics facilities, and military hospitals could directly affect equipment safety, material storage, and troop health. Accordingly, the WLC framework assigns higher scores through the military-impact criterion (C4), ensuring that environmentally sensitive and operationally critical areas receive greater monitoring attention.

Figure 1. Summary of composite S values at the selected monitoring sites: (a) Surface water; (b) Groundwater; (c) Soil. Unit codes correspond to the military units listed in table 3.

Table 3. *Sampling locations and number of environmental samples at 22 military bases.*

No.	Code	Unit name	Description of sampling location	Geographic coordinates
I	**Command headquarters block**			
1	SCH	Provincial military command (Headquarters)	Pond behind the cafeteria, vegetable garden, internal pond, and residential area.	9°55'36.66"N 106°19'41.05"E
2	TM	Staff department	Pond behind the unit, green area in front of headquarters, and surrounding residential area	9°55'34.81"N 106°19'44.63"E
3	CT	Political department	Pond behind the unit, residential area, and behind No. 56 Vo Van Kiet Street	9°55'34.51"N 106°19'44.76"E
4	HC	Logistics-technical department	Internal pond, military parade yard, and nearby residential area	9°55'35.99"N 106°19'44.86"E
5	QB	Military affairs office	Pond behind the unit, cultivation area, and residential area along Nguyen Dang Street	9°54'45.31"N 106°20'29.60"E
II	**Subordinate units block**			
6	BV	Military hospital	Pond/land behind hospital campus, treatment area, and surrounding residential area.	9°55'43.81"N 106°19'58.31"E
7	SCH926	Regiment 926 (Headquarters)	Pond/land around headquarters, training ground (main), and residential area	9°53'34.02"N 106°15'9.72"E
8	BB501	Battalion 501	Pond/land at cultivation area, access road, and administrative area.	9°55'23.10"N 106°18'23.86"E
9	NT	State-owned farm 926	Cultivation area, internal canals, and nearby residential area.	9°55'1.55"N 106°17'55.30"E
10	DDK	Storage company	Warehouse area, command house, medicinal garden, and pond behind cultivation area.	9°52'47.24"N 106°17'47.59"E
11	TSC	Repair station	Repair workshop area, warehouse, front yard, and rear area.	9°55'37.78"N 106°22'3.17"E
12	CB	Engineering company	Warehouse area, ammunition bunker, cultivation garden, and combat pond	9°55'35.64"N 106°22'4.59"E
13	TS	Reconnaissance company	Working area, main gate, vegetable garden, and nearby residential area.	9°54'44.94"N 106°20'36.93"E

III	**District military command block**			
14	TPTV	Tra Vinh City military command	Pond behind unit, residential area, backyard, and adjacent households	9°58'15.18"N 106°20'7.21"E
15	CTH	Chau Thanh district military command	Pond area, training ground, administrative house, and medicinal garden	9°52'24.95"N 106°21’41.91”E
16	CL	Cang Long district military command	Pond/land at cultivation area, main gate, and warehouse area.	9°58’6.83”N 106°14'44.82"E
17	TC	Tieu Can district military command	Internal pond, cultivation garden, warehouse area, rest area, and cultivation garden.	9°48'18.73"N 106°10’39.75”E
18	CN	Cau Ngang district military command	Pond area, administrative area, front yard, and nearby residential area.	9°47’34.99”N 106°26'46.99"E
19	CK	Cau Ke district military command	Pond behind unit, residential area, backyard, and nearby households.	9°52'4.38"N 106° 3’27.17”E
20	TRC	Tra Cu district military command	Pond area, training ground, administrative house, and medicinal garden.	9°40’29.98”N 106°15'50.23"E
21	HDH	Duyen Hai district military command	Pond/land at cultivation area, main gate, and residential area.	9°38'8.01"N 106°25’54.99”E
22	TXDH	Duyen Hai town military command	Pond/land at rice field area, warehouse area, rest area, and cultivation garden.	9°39’54.52”N 106°30'35.91"E
Total		**286 samples**	**110 surface-water samples** **110 ground-water samples** **66 soil samples**	

To capture the most vulnerable conditions, sampling was conducted during the peak dry season (January-February 2025), when saline intrusion and groundwater depletion reach their maximum levels. All sampling and sample preservation procedures were carried out in accordance with standard technical regulations to ensure data reliability and to minimize errors caused by cross-contamination [19, 20]. The application of the WLC method in this study aligns with previous research using GIS-based MCDA for environmental planning and site suitability assessment. WLC is widely used in spatial multi-criteria evaluation because it integrates multiple environmental and socio-economic factors through weighted averaging [8]. It has been successfully applied to environmental planning tasks such as landfill site selection, land-use suitability analysis, and environmental hazard assessment [21], demonstrating its transparency and flexibility in combining heterogeneous spatial data and expert knowledge for decision-making.

3.3. Model validation

To assess the reliability of the WLC-based prioritization framework, the ranking results were validated against environmental and operational characteristics observed during field surveys. Sites classified as *Very High* and *High* priority were mainly located in technical, logistics, and production units where potential pollution sources - such as repair workshops, storage facilities, cultivation areas, and wastewater discharge points - were concentrated. In contrast, administrative and training units generally received lower scores due to the absence of major pollution sources. This spatial pattern aligns with the observed distribution of environmental risks, indicating that the WLC model effectively captures key environmental and operational factors. The results were also reviewed by the expert panel involved in the evaluation process, who confirmed that the selected monitoring locations were appropriate and representative for environmental monitoring in the studied military units.

3.4. Study limitations

Despite the usefulness of the proposed framework, several limitations should be acknowledged. The weighting and scoring processes relied on expert judgment, which may introduce some subjectivity despite the use of multiple experts. In addition, the analysis was based on spatial datasets representing conditions at a specific time and did not incorporate dynamic GIS data or temporal environmental variations. Future studies could improve the approach by integrating larger expert groups, time-series environmental data, and dynamic GIS-based modeling.

4. CONCLUSIONS

The proposed WLC-based prioritization framework effectively optimized the environmental monitoring network by reducing the number of sampling sites from 346 candidates to 286 prioritized locations (a 17.3% reduction) while maintaining representative coverage of environmentally sensitive and operationally critical areas. By integrating environmental vulnerability, functional land use, and operational sensitivity into a unified decision index, the model provides a rational basis for identifying priority monitoring sites. The results show that environmental risk is unevenly distributed across military units, with higher priorities assigned to technical, logistics, and medical units due to their closer association with pollution sources and sensitive receptors. The framework also offers a transferable and transparent tool that can be adapted to other military or security-managed regions by adjusting criteria weights to local conditions. Overall, it provides a practical decision-support approach for improving environmental monitoring and sustainable management in coastal defense areas.

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TÓM TẮT

Khung đánh giá đa tiêu chí dựa trên phương pháp tổ hợp tuyến tính có trọng số để ưu tiên hóa các vị trí quan trắc môi trường tại các khu vực quân sự ven biển ở Đồng bằng sông Cửu Long, Việt Nam

Các khu vực quân sự ven biển ở Đồng bằng sông Cửu Long ngày càng chịu nhiều áp lực môi trường do xâm nhập mặn, biến đổi khí hậu và các nguồn ô nhiễm kết hợp từ hoạt động quân sự và dân sự. Tuy nhiên, hầu hết các khung giám sát môi trường hiện nay được thiết kế cho bối cảnh dân sự và ít xem xét đến đặc thù vận hành của các cơ sở quân sự. Nghiên cứu này đề xuất một khung ra quyết định đa tiêu chí dựa trên phương pháp tổ hợp tuyến tính có trọng số (WLC) nhằm ưu tiên lựa chọn các vị trí quan trắc môi trường tại các đơn vị quân sự ven biển ở tỉnh Vĩnh Long (trước đây là tỉnh Trà Vinh), Việt Nam. Sáu tiêu chí bao gồm mức độ ô nhiễm nền, khả năng tích tụ chất ô nhiễm, tính đại diện của khu vực, mức độ ảnh hưởng đến hoạt động quân sự, khả năng tiếp cận khi lấy mẫu và mức độ nhạy cảm về sinh thái – xã hội được tích hợp và gán trọng số riêng cho đất, nước mặt và nước ngầm. Tổng cộng 346 vị trí tiềm năng thuộc 22 đơn vị quân sự đã được đánh giá thông qua khảo sát thực địa, dữ liệu môi trường và phân tích không gian. Mô hình đã xác định 286 vị trí ưu tiên quan trắc (82,6%), bao gồm 110 điểm nước mặt, 110 điểm nước ngầm và 66 điểm đất, trong đó các đơn vị kỹ thuật và sản xuất có điểm ưu tiên cao hơn do nguy cơ ô nhiễm lớn hơn. Khác với các ứng dụng WLC truyền thống, khung phương pháp đề xuất tích hợp yếu tố nhạy cảm vận hành quân sự và áp dụng trọng số riêng cho từng thành phần môi trường, cho phép xác định ưu tiên quan trắc sát với thực tế hơn trong các khu vực do quân đội quản lý. Phương pháp này cung cấp một công cụ minh bạch và có khả năng chuyển giao để tối ưu hóa mạng lưới quan trắc môi trường tại các vùng ven biển thuộc khu vực kiểm soát quân sự.

Từ khoá: Ra quyết định đa tiêu chí; Tổ hợp tuyến tính có trọng số; Quan trắc môi trường; Khu vực quân sự.