






Neutrosophic Insights into Military Interventions: Assessing Legitimacy and Consequences in International Law

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Abstract: This scientific paper analyzes the legitimacy of military interventions within the framework of international law and their potential consequences. It highlights the need to support these interventions with robust legal and moral reasoning due to their complexity and controversy in the international community. The interpretation of legal and ethical principles can be subjective and lead to disagreements among states and international actors. The consequences of military interventions are explored, ranging from loss of life and infrastructure destruction to population displacement, political instability, and humanitarian crises. Legality and proportionality in interventions are essential to ensuring their legitimacy, and the potential consequences must be carefully assessed before undertaking an intervention. Adherence to the international legal framework is crucial to prevent military interventions from being deemed violations of international law. The neutrosophic DEMATEL methodology used in the study identifies cause-and-effect relationships among key criteria related to military actions in the realm of international law. The article highlights the importance of carefully considering the legitimacy and potential consequences of military interventions within the context of international law.

Keywords: Neutrosophic DEMATEL; Criteria; Cause and Effect; International Law; Military Interventions.

1. Introduction

The legitimacy of military interventions is often a subject of debate and controversy. Military interventions can lead to unforeseen consequences, such as the escalation of conflict, destruction of infra-structure, and loss of lives. Therefore, any military intervention must be carefully considered and supported by robust legal and moral reasons. The international community often discusses the legitimacy of such interventions and the need to balance state sovereignty with the protection of human rights.

International law establishes the fundamental principle of state sovereignty, prohibiting the use of force in international relations unless it is in legitimate self-defense or authorized by the United Nations Security Council. This is done to maintain international peace and security and prevent unwanted armed conflicts [1].

However, in some cases, it has been argued that military interventions can be justified under certain circumstances, such as when a state fails to fulfill its obligation to protect its population from mass atrocities, such as genocide. Here, the principle of the Responsibility to Protect (R2P) plays a relevant role in international law, allowing for limited and proportionate interventions to prevent massive human suffering [2].

The legitimacy of military interventions is also related to respect for human rights. When severe and systematic violations of human rights occur in a country, it can be argued that intervention is

necessary to stop human suffering and protect the fundamental rights of the population. However, the interpretation of these principles can be subjective and lead to disagreements among states and inter-national actors.

Military interventions in the context of international law are regulated by a legal framework that seeks to maintain international peace and security, as well as protect the sovereignty of states and human rights [3]. In this context, the following aspects are crucial:

- **Legal Justification:** Military intervention can be considered legitimate if it is supported by international law. Article 2(4) of the United Nations Charter prohibits the use of force in international relations unless in self-defense or authorized by the United Nations Security Council. Security Council resolutions can authorize military interventions in situations threatening international peace and security.
- **Self-defense:** A state has the right to use military force in self-defense when attacked or facing an imminent threat of armed attack. This is a fundamental principle of international law.
- **Consent of the Affected State:** In some cases, military intervention may be considered legitimate if the affected state requests military assistance from another state or an international coalition to address a crisis or internal conflict. The consent of the affected state is an important element for legitimacy.
- **Responsibility to Protect (R2P):** The Responsibility to Protect is an international norm that holds the international community responsible for intervening when a state cannot or is unwilling to protect its population from mass atrocities, such as genocide, crimes against humanity, or ethnic cleansing.
- **Moral and Ethical Justification:** In addition to legal justification, military interventions can also be evaluated from a moral and ethical perspective. Some argue that military intervention can be legitimate if it is the only way to stop massive human suffering or prevent atrocities.
- **Legality and Proportionality:** Any use of military force must be legal and proportional. This means it must comply with international law and must not cause unnecessary or disproportionate harm.
- **Evaluation of Consequences:** Before undertaking military intervention, states must carefully assess potential consequences, including humanitarian and political aspects, and consider whether intervention is the most appropriate option to address the situation.

It is important to note that military interventions without authorization from the UN Security Council or without a clear case of legitimate self-defense may be considered violations of international law. The consequences of unauthorized interventions can include international sanctions and criticism from the international community [4]. Therefore, respecting the international legal framework is crucial to ensure that military interventions are legal and legitimate [5].

Military interventions, whether carried out by a single state or a coalition of states, can have a range of consequences [6-14]. Some of these consequences can be complex and long-lasting, varying depending on the nature and purpose of the intervention, as well as how it is conducted. Some possible consequences of military interventions include [7, 8]:

- **Loss of lives:** Military interventions often involve the use of force, resulting in the loss of human lives, both military personnel and civilians. Armed conflicts can lead to significant casualties.
- **Destruction of infrastructure:** Military engagements can cause damage to civil infrastructure, including roads, bridges, hospitals, schools, and water and energy supply systems. This can have a long-term impact on a country's resilience.
- **Population displacement:** Military interventions can force people to leave their homes, often resulting in internal displacement or refugees. This can lead to humanitarian crises.

- Political instability: Military interventions can disrupt the political balance in a country, leading to instability and power struggles. This can prolong or worsen the conflict.
- Sectarianism and polarization: Military interventions can sometimes exacerbate existing ethnic, religious, or political tensions in a country, leading to increased sectarianism and polarization.
- Economic damage: War and resulting instability can cause significant harm to a country's economy, negatively impacting the lives of its inhabitants.
- Humanitarian crises: Military interventions can result in humanitarian crises, including a lack of food, water, and medical care, as well as exposure to diseases.
- Radicalization and terrorism: Military interventions can sometimes increase the recruitment of extremist groups and lead to the emergence of terrorist groups as some individuals radicalize in response to foreign military presence.
- Long-term impact on the region: Military interventions can also have lasting effects on the surrounding region, including the displacement of refugees to neighboring countries and the exacerbation of regional conflicts.
- Political and diplomatic repercussions: Military interventions can have repercussions on international relations, affecting diplomatic and political relationships between the involved countries.

The practice of military interventions has shown that they can have significant consequences, including loss of lives, destruction of infrastructure, and the creation of internally displaced persons and refugees. Therefore, it is crucial that any military intervention is supported by solid legal and moral reasons and is carried out proportionally with a focus on long-term reconstruction and peace consolidation.

It is important to note that the consequences of military interventions can vary widely depending on the nature of the conflict, how the intervention is conducted, and other factors. For this reason, military interventions are often subject to intense debates and evaluations before, during, and after their execution, aiming to minimize negative impacts and promote long-term stability and peace. In summary, military interventions in International Law are a complex issue that involves a delicate balance between respecting state sovereignty, protecting human rights, and preserving international peace and security. The international community often faces the challenge of balancing these principles in a world where humanitarian crises and armed conflicts pose significant ethical and legal dilemmas. The work presented here analyzes, through multicriteria methods, the legitimacy and consequences of military interventions in the context of International Law.

2. Preliminaries

Definition 1. Suppose we have a nonempty space (or set) denoted as X , which is part of a larger universe of discourse called U . Let $\langle A \rangle$ represent an element, which could be a concept, attribute, idea, proposition, theory, etc., defined within the set X . Through a process called neutrosophication, we divide the set X into three distinct regions: two opposing ones $\langle A \rangle$ and $\langle \text{anti}A \rangle$, and a neutral (indeterminate) region $\langle \text{neut}A \rangle$ positioned between them. These regions may or may not overlap, depending on the specific application, but they collectively cover the entire space.

A NeutroAlgebra is an algebraic structure that incorporates at least one NeutroOperation or one NeutroAxiom. A NeutroOperation is an operation that yields true results for some elements, indeterminate outcomes for others, and false results for yet another group of elements. This NeutroAlgebra concept is an extension of the Partial Algebra, which is an algebra that features at least one Partial Operation while all its Axioms are entirely true (classical axioms).

Definition 2. In the field of mathematics, a function denoted as $f: X \rightarrow Y$ is called a Partial Function when it exhibits a clear and precise behavior for certain elements within the set X while remaining undefined for all remaining elements in X . Consequently, there are particular elements denoted as 'a' within X for which the function $f(a)$ is well-defined, and for all other elements, denoted as 'b' within X , the function $f(b)$ remains undefined.

Definition 3. A function $f: X \rightarrow Y$ is called a NeutroFunction if it has elements in X for which the function is well-defined {degree of truth (T)}, elements in X for which the function is indeterminate {degree of indeterminacy (I)}, and elements in X for which the function is outer-defined {degree of falsehood (F)}, where $T, I, F \in [0, 1]$, with $(T, I, F) \neq (1, 0, 0)$ that represents the (Total) Function, and $(T, I, F) \neq (0, 0, 1)$ that represents the AntiFunction. Classification of Functions [9] (Figure 1).

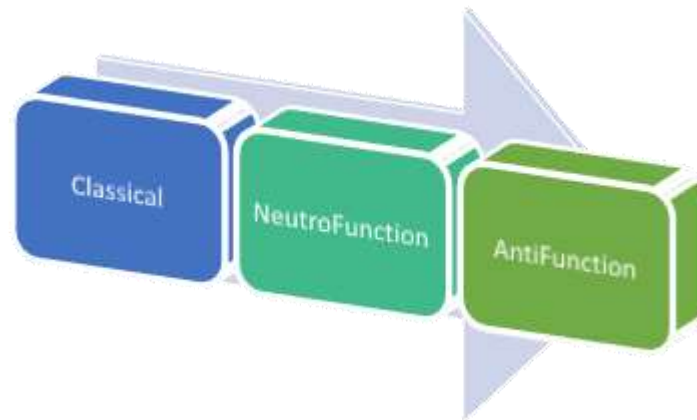


Figure 1. Classification of functions (Source: own elaboration).

Definition 4. A (classical) Algebraic Structure (or Algebra) is an unoccupied collection A that is equipped with certain (completely well-defined) operations (functions) on A , and it adheres to particular (classical) axioms (completely valid) - as per Universal Algebra.

Definition 5. A (classical) Partial Algebra is an algebra established on an unoccupied set PA that is furnished with some partial operations (or partial functions: partly well-defined, and partly undefined). However, the axioms (laws) established for a Partial Algebra are entirely (100%) true.

Definition 6. A NeutroAxiom (or Neutrosophic Axiom) defined on a nonempty set is an axiom that is true for some set of elements {degree of truth (T)}, indeterminate for other set of elements {degree of indeterminacy (I)}, or false for the other set of elements {degree of falsehood (F)}, where $T, I, F \in [0, 1]$, with $(T, I, F) \neq (1, 0, 0)$ that represents the (classical) Axiom, and $(T, I, F) \neq (0, 0, 1)$ that represents the AntiAxiom.

A (classical) Algebra is a nonempty set CA that is endowed with total operations (or total functions, i.e., true for all set elements) and (classical) Axioms (also true for all set elements). A NeutroAlgebra (or NeutroAlgebraic Structure) is a nonempty set NA that is endowed with at least one NeutroOperation (or NeutroFunction), or one NeutroAxiom that is referred to the set (partial-, neutro-, or total-) operations. An AntiAlgebra (or AntiAlgebraic Structure) is a nonempty set AA that is endowed with at least one AntiOperation (or AntiFunction) or at least one AntiAxiom.

Additionally, the PROSPECTOR function is defined in the MYCIN expert system in the following way: it is a mapping from $[-1, 1]^2$ into $[-1, 1]$ with formula:

$$P(x, y) = \frac{x+y}{1+xy} \tag{1}$$

This function is a uninorm, with neutral element 0, thus it fulfills commutativity, associativity, and monotonicity. Here we respect the condition that $P(-1,1)$ and $P(1, -1)$ are undefined.

Otherwise, for convenience $P(x, y)$ is extended to $\bar{P}(x, y)$ such that:

$$\bar{P}(x, y) = P(x, y) \text{ for all } (x, y) \in [-1, 1]^2 \setminus \{(-1,1), (1, -1)\},$$

$$\bar{P}(-1,1) = \bar{P}(1, -1) = \text{undefined},$$

$$\bar{P}(\text{undefined}, \text{undefined}) = \text{undefined}.$$

$$\bar{P}(\text{undefined}, x) = \bar{P}(x, \text{undefined}) = \begin{cases} \text{undefined, if } x > 0 \\ x, \text{ if } x \leq 0 \end{cases}.$$

Definition 7. Let S be a finite set defined as $S = \{(x, y): x, y \in \{\frac{k}{10}, \text{undefined}\}, k \in \mathbb{Z} \cap [-10, 10]\}$.

The operator \odot is defined for every $(x, y) \in S$, such that:

- If $\bar{P}(x, y)$ is not undefined, then $x \odot y = \frac{\text{round}(\bar{P}(x,y)*10)}{10}$, where *round* is the function that outputs the integer nearest to the argument.
- If $\bar{P}(x, y)$ is undefined then $x \odot y = \text{undefined}$.

Then \odot is a finite NeutroAlgebra. This is because \odot is commutative and associative for the subset of elements of S without any undefined component, but it is not associative otherwise.

E.g., if $a = -0.9$, $b = 0.8$, $c = \text{undefined}$, then $a \odot (b \odot c) = a$ and $(a \odot b) \odot c = -0.4 \neq a$, therefore associativity is a NeutroAxiom.

Function *round* is used for guarantying \odot is an inner operator.

In this case, Cayley tables are used to generate data on the same scale as the input data. This is achieved by multiplying these elements by 10, allowing the obtainment of input values in a range between -10 and 10. Table 1 shows the results of this operation.

2.1 Neutrosophic DEMATEL using single-valued neutrosophic sets

Definition 8. Let X be a space of points (objects) with generic elements in X denoted by x . A single-valued neutrosophic set (SVNS) A in X is characterized by truth-membership function $TA(x)$, indeterminacy-membership function $IA(x)$, and falsity membership function $FA(x)$. Then, an SVNS A can be denoted by $A = \{x, TA(x), IA(x), FA(x) \mid x \in X\}$, where $TA(x), IA(x), FA(x) \in [0, 1]$ for each point x in X . Therefore, the sum of $TA(x), IA(x)$ and $FA(x)$ satisfies the condition $0 \leq TA(x) + IA(x) + FA(x) \leq 3$.

Definition 9. Let $E_k = (T_k, I_k, F_k)$ be a neutrosophic number defined for the rating of the k -th decision-maker. Then, the weight of the k -th decision-maker can be written as:

$$\psi_k = \frac{1 - \sqrt{[(1-T_k(x))^2 + (I_k(x))^2 + (F_k(x))^2] / 3}}{\sum_{k=1}^p \sqrt{[(1-T_k(x))^2 + (I_k(x))^2 + (F_k(x))^2] / 3}} \tag{2}$$

Further, in achieving a favorable solution, group decision-making is important in any decision-making process. In the group decision-making process, all the individual decision-maker assessments need to be aggregated into one aggregated neutrosophic decision matrix. This can be done by employing a single-valued neutrosophic weighted averaging (SVNWA) aggregation operator proposed by Ye [10-13].

Definition 10. [10] Let $D^{(k)} = (d_{ij}^{(k)})_{m \times n}$ be the single-valued neutrosophic decision matrix of the k -th decision maker and $\psi = (\psi_1, \psi_2, \dots, \psi_p)^T$ be the weight vector of decision maker such that each $\psi_k \in [0, 1]$, $D = (d_{ij})_{m \times n}$ where

$$d_{ij} = \langle 1 - \prod_{k=1}^p (1 - T_{ij}^{(p)})^{\psi_k}, \prod_{k=1}^p (I_{ij}^{(p)})^{\psi_k}, \prod_{k=1}^p (F_{ij}^{(p)})^{\psi_k} \rangle \tag{3}$$

Table 1. Cayley's table of multiplication by 10. \odot . (Source: own elaboration).

$x \odot y$	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	I	1	2	3	4	5	6	7	8	9	10	
-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	-10	I
-9	-10	-10	-10	-10	-10	-10	-10	-9	-9	-9	-9	-9	-9	-9	-8	-8	-7	-7	-5	-4	0	4	10
-8	-10	-10	-10	-10	-9	-9	-9	-9	-9	-8	-8	-8	-8	-7	-7	-6	-5	-4	-2	0	4	4	10
-7	-10	-10	-10	-9	-9	-9	-9	-8	-8	-7	-7	-7	-6	-6	-5	-4	-3	-2	0	2	5	5	10
-6	-10	-10	-9	-9	-9	-8	-8	-8	-7	-7	-6	-6	-5	-5	-4	-3	-1	0	2	4	7	7	10
-5	-10	-10	-9	-9	-8	-8	-8	-7	-6	-6	-5	-5	-4	-3	-2	-1	0	1	3	5	7	7	10
-4	-10	-10	-9	-9	-8	-8	-7	-6	-6	-5	-4	-4	-3	-2	-1	0	1	3	4	6	8	8	10
-3	-10	-9	-9	-8	-8	-7	-6	-6	-5	-4	-3	-3	-2	-1	0	1	2	4	5	7	8	8	10
-2	-10	-9	-9	-8	-7	-6	-6	-5	-4	-3	-2	-2	-1	0	1	2	3	5	6	7	9	9	10
-1	-10	-9	-8	-7	-7	-6	-5	-4	-3	-2	-1	-1	0	1	2	3	4	5	6	8	9	9	10
I	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	I	I	I	I	I	I	I	I	I	I	I	I
0	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	0	1	2	3	4	5	6	7	8	9	9	10
1	-10	-9	-8	-6	-5	-4	-3	-2	-1	0	1	I	2	3	4	5	6	7	7	8	9	9	10
2	-10	-9	-7	-6	-5	-3	-2	-1	0	1	2	I	3	4	5	6	6	7	8	9	9	9	10
3	-10	-8	-7	-5	-4	-2	-1	0	1	2	3	I	4	5	6	6	7	8	8	9	9	9	10
4	-10	-8	-6	-4	-3	-1	0	1	2	3	4	I	5	6	6	7	8	8	9	9	9	10	10
5	-10	-7	-5	-3	-1	0	1	2	3	4	5	I	6	6	7	8	8	8	9	9	9	10	10
6	-10	-7	-4	-2	0	1	3	4	5	5	6	I	7	7	8	8	8	9	9	9	9	10	10
7	-10	-5	-2	0	2	3	4	5	6	6	7	I	7	8	8	9	9	9	9	10	10	10	10
8	-10	-4	0	2	4	5	6	7	7	8	8	I	8	9	9	9	9	9	10	10	10	10	10
9	-10	0	4	5	7	7	8	8	9	9	9	I	9	9	9	10	10	10	10	10	10	10	10
10	I	10	10	10	10	10	10	10	10	10	10	I	10	10	10	10	10	10	10	10	10	10	10

Definition 11. Deneutrosophication of SVN \tilde{N} can be defined as a process of mapping \tilde{N} into a single crisp output $f: \tilde{N} \rightarrow \psi^*$ for $x \in X$. If \tilde{N} is a discrete set, then the vector of tetrads $\tilde{N} = \{(x | T\tilde{N}(x), I\tilde{N}(x), F\tilde{N}(x)) | x \in X\}$ is reduced to a single scalar quantity $\psi^* \in X$ by deneutrosophication. The obtained scalar quantity $\psi^* \in X$ best represents the aggregate distribution of three membership degrees of neutrosophic element $T\tilde{N}(x), I\tilde{N}(x), F\tilde{N}(x)$. Therefore, deneutrosophication can be obtained as follows.

$$\psi^* = 1 - \sqrt{[(1 - T_k(x))^2 + (I_k(x))^2 + (F(x))^2]/3} \tag{4}$$

Decision-making normally involves human language, commonly referred to as linguistic variables. A linguistic variable simply represents words or terms used in human language. Therefore, this linguistic variable approach is a convenient way for decision-makers to express their assessments. Ratings of criteria can be expressed by using linguistic variables such as very influence (VI), influence (I), low influence (LI), no influence (NI), etc. Linguistic variables can be transformed into SVN s as shown in Table 2.

Table 2. Linguistic variable and Single Valued Neutrosophic Numbers (SVNNs) [11].

Integer	Linguistic variable	SVNNs
0	No influence/Not important	(0.10,0.80,0.90)
1	Low influence/important	(0.35,0.60,0.70)
2	Medium influence/important	(0.50,0.40,0.45)
3	High influence/important	(0.80,0.20,0.15)
4	Very high influence/important	(0.90,0.10,0.10)

To carry out the DEMATEL method in its neutrosophic variant, follow the steps set out below [12] (Figure 2):

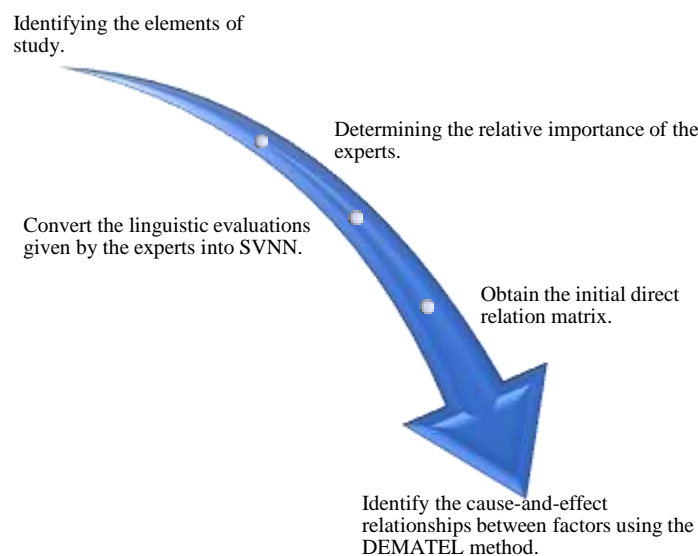


Figure 2. Steps of the neutrosophic DEMATEL method.

Through the application of semi-structured interviews to a population of interest and brainstorming, a set of influential factors in the subject under study is determined. Subsequently, experts are asked to assess the direct influence between factors through paired comparisons, using the scoring shown in Table 2.

The group of experts has their values of importance based on their level of experience and knowledge in the decision problem. Therefore, the weight of each decision-maker may be different from that of other decision-makers. The weight of each decision-maker is considered with linguistic variables and transmitted into SVNN to be later identified through Eq. (2).

From the individual crisp matrices obtained from the evaluations of the experts, individual neutrosophic matrices of decision-makers are constructed according to the indications in Table 2. To obtain the initial direct relation matrix, which is in the form of crisp numbers, the neutrosophic matrices of individual decision-makers must be aggregated and deneutrosophied using Eqs. (3) and (4) respectively. Based on the aggregated direct relation matrix A obtained in step 4, the total relation matrix T can be easily calculated using Eqs. (5-7) as shown below:

$$D = A * S \tag{5}$$

Where

$$S = \frac{1}{\max_{l \leq i \leq n} \sum_{j=1}^n a_{ij}} \tag{6}$$

and

$$T = D * (ID) - 1 \quad (7)$$

where I is the identity matrix. From this, the cause-effect relationship diagram $(ri + ci, ri - ci)$ is constructed.

- Analyze the cause-effect relationship diagram. The $(ri - ci)$ indicates the importance of each factor while $(ri + ci)$ is the net cause or effect group. The $(ri + ci)$ is called "Prominence" and it measures the degree of the central role that the factor or criterion plays within the system.

3. Results

The analysis of international law and armed conflict is a complex task involving a series of key criteria and considerations. After collaborating with experts and examining reference documentation, the following criteria are chosen for analysis:

- Justification of the use of force: Evaluate whether the use of force in an armed conflict is consistent with international law, including the United Nations Charter and resolutions of the UN Security Council. The legality of the use of force may depend on factors such as self-defense, authorization from the UN Security Council, or the consent of the state in whose territory the conflict is taking place.
- Respect for the principle of proportionality: Analyze whether military actions are proportionate to the objectives pursued and whether damage to civilians and civilian infrastructure is minimized. Proportionality is a fundamental principle of humanitarian law.
- Protection of civilians: Verify whether the parties in conflict are fulfilling their obligation to distinguish between combatants and civilians and whether they are taking measures to protect civilians from unnecessary harm.
- Regional stability: International law seeks to promote peace and stability in world regions while providing a normative framework to address and resolve armed conflicts when they arise.
- International criminal responsibility: Consider whether serious violations of international humanitarian law and human rights are being investigated and whether those responsible are being brought to justice, either at the national level or through international tribunals.
- Humanitarian assistance: Evaluate whether safe and unrestricted access of humanitarian organizations to conflict-affected areas is allowed and whether humanitarian assistance is provided impartially to those in need.
- Rights of refugees and internally displaced persons: Consider whether the rights of people displaced by the conflict, including their right to seek asylum and their right to dignified and humanitarian treatment, are being respected.
- Application of sanctions and arms embargoes: Assess whether international sanctions and arms embargoes are being properly applied in conflicts to prevent the flow of arms to the parties involved.

These are some of the key criteria that can be relevant for a comprehensive analysis of international law and armed conflict. Evaluating an armed conflict based on these criteria can help determine whether the parties involved are fulfilling their legal and ethical obligations within the framework of international law.

Considering these elements, the DEMATEL methodology is employed to detect possible cause-and-effect relationships among these components. The result of this analysis simplifies the focus of the upcoming interview on the topics that have a more significant impact and relevance, which are the true triggers of the crisis, as indicated by the selected experts. In this process, a team of 5 specialists is involved.

Subsequently, a questionnaire is implemented targeting a group of professionals with experience in the field of study. The interviews conducted with these individuals use linguistic variables, contributing to a better understanding of the data and allowing for a more precise assessment by the participants.

Specifically, a group of 56 officials was chosen to respond to the designed study questions. Each of them is asked to rate the statements presented using a positive scale, assigning up to 10 points if they have a favorable opinion on the analyzed topic. Conversely, if they have an unfavorable opinion, they are to rate on a scale ranging from -10 to -1.

The notation v_{ij} , where $i = 1, 2, \dots, 56$; $j = 1, 2, \dots, n$ represents the evaluation of the i -th official on the j -th aspect.

Afterwards, the calculation of $\bar{v}_i = \left(\frac{\sum_{j=1}^{n^+} v_{ij}^+}{n^+}, \frac{\sum_{j=1}^{n^0} v_{ij}^0}{n^0}, \frac{\sum_{j=1}^{n^-} v_{ij}^-}{n^-} \right)$ is performed as follows: the positive responses of the i -th official on the j -th aspects are treated as neutral responses, resulting in $\frac{\sum_{j=1}^{n^0} v_{ij}^0}{n^0} = 0$, and v_{ij}^- represents negative responses. Additionally, n^+ , n^0 , and n^- represent the numbers of positive, neutral, and negative responses, respectively. This novel approach ensures greater precision in the results than a simple arithmetic mean calculation. Subsequently, the calculation of $\hat{v}_i = \text{round} \left(\frac{\sum_{j=1}^{n^+} v_{ij}^+}{n^+} \right) \odot \text{round} \left(\frac{\sum_{j=1}^{n^-} v_{ij}^-}{n^-} \right)$ is performed. In cases where both $\text{round} \left(\frac{\sum_{j=1}^{n^+} v_{ij}^+}{n^+} \right) = 10$, and $\text{round} \left(\frac{\sum_{j=1}^{n^-} v_{ij}^-}{n^-} \right) = -10$, it is defined that $\hat{v}_i = -10$.

The decision-making process occurs in two different situations:

- If less than 30% of the respondents yield contradictory results for each fixed j , i.e., if there are 30 pairs or fewer of values of $(-10, 10)$ or $(10, -10)$, these values are excluded for aggregation.
- Otherwise, the j -th aspect is assessed as "undefined," and a more detailed review is required to understand why such a contradiction exists.

In the first case, when aggregation is performed, \hat{v}_i is calculated using the \odot operator.

The implementation of the suggested approach allowed establishing the presence of a causal relationship among the originally examined elements. Thus, Table 3 provides a summary of the main elements of interest. This achieved clarity regarding the criteria evaluated concerning military actions in the realm of international law.

Table 3. Results of the application of the DEMATEL method.

Query elements	Ri + Ci	Ri - Ci
Justification of the use of force	8,572	0.106
Respect for the principle of proportionality	6,501	0.037
Protection of civilians	6.86	-0.254
International criminal responsibility	6,739	-0.021
Humanitarian assistance	7,449	0.979
Law of refugees and internally displaced persons	8.38	0.612
Application of sanctions and arms embargoes	6,094	-1,246
Justification of the use of force	5,329	-0.213

4. Discussion

As can be observed, in the studied system, the most related factors are the justification of the use of force, respect for the principle of proportionality, humanitarian assistance, and the rights of refugees and internally displaced persons. The relationship values indicate a strong connection when evaluating assessments of factors affecting military interventions.

Given the previous results, the interview with the selected officials will be strongly influenced by these four elements, allowing for a deeper exploration of causal factors whose elimination or reduction has a greater impact. In this regard, each of these four elements was broken down into five questions designed to determine the level of opinion of the interviewees. The results of the analysis showed an average value of 5. Although these results showed positivity, unfavorable responses were observed regarding humanitarian assistance and the rights of refugees and internally displaced persons.

Regarding the interview results concerning humanitarian assistance, it was noted that despite the existence of international norms and principles supporting humanitarian assistance in armed conflicts, the effectiveness and access to humanitarian aid can be hindered by various barriers. These include a lack of secure access to affected areas, a lack of cooperation from conflicting parties, and insufficient funds for assistance. To improve this, the following is proposed:

- (i). Promote cooperation between conflicting parties to enable safe and unrestricted access for humanitarian organizations.
- (ii). Increase funding and resources allocated to humanitarian assistance, both at the national and international levels.
- (iii). Develop monitoring and accountability mechanisms to ensure that assistance reaches those in need and is used appropriately.

Regarding the rights of refugees and internally displaced persons, the discussion was expanded to address the persistent lack of access to essential services, discrimination, and the lack of guarantees for a safe return. The following strategies were proposed:

- (i). Raise awareness within the international community about the importance of protecting the rights of refugees and internally displaced persons and exert pressure on conflicting parties to fulfill their legal obligations.
- (ii). Facilitate the identification and registration of displaced individuals, ensuring proper documentation and access to basic services such as healthcare and education.
- (iii). Promote durable solutions, such as the voluntary and safe return of internally displaced persons and refugees when possible, or local integration when necessary.

Both humanitarian assistance and the rights of refugees and internally displaced persons are essential elements within the framework of international law in armed conflicts. To enhance their effectiveness, it is crucial to address existing barriers and work on strategies that promote their fulfillment and protection in conflict situations.

5. Conclusions

This scientific article has explored the legitimacy of military interventions in the context of International Law and analyzed the potential consequences of such interventions. The legitimacy of military interventions is a complex and debated topic in the international community, emphasizing the importance of supporting any military intervention with strong legal and moral reasons.

The interpretation of legal and ethical principles related to military interventions can be subjective, leading to disagreements among states and international actors. Military interventions can have various consequences, ranging from loss of lives and infrastructure destruction to population displacement, political instability, and humanitarian crises.

The legality and proportionality of military interventions are crucial to ensuring their legitimacy. Potential consequences must be carefully evaluated before undertaking an intervention. Adherence to the international legal framework is essential to prevent military interventions from being considered violations of International Law, which could lead to international sanctions and criticism from the global community.

The neutrosophic DEMATEL methodology used in this study has allowed the identification of cause-and-effect relationships among key criteria related to military actions in the field of international law. In summary, this article highlights the importance of carefully considering the legitimacy and potential consequences of military interventions in the context of International Law. The complexity of this issue and the need to balance state sovereignty, protection of human rights, and preservation of international peace and security make it crucial to conduct comprehensive assessments and ongoing debates in the international community.

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Data availability

The datasets generated during and/or analyzed during the current study are not publicly available due to the privacy-preserving nature of the data but are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare that there is no conflict of interest in the research.

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

References

1. López Zamarripa, N. (2017). La importancia de la soberanía y el estado constitucional en el derecho internacional. *Revista de la Facultad de Derecho de México*, 67(267), 249-282.
2. Itziar, R. U. Í. Z., & González, E. A. (2019). El principio de la Responsabilidad de Proteger (R2P) en medio de las turbulentas aguas del debate entre Orden y Justicia/Entrevistas a Varios Autores. *Relaciones Internacionales*, (41), 111-121.
3. Roncagliolo Benítez, I. (2015). El principio de no intervención: consagración, evolución y problemas en el Derecho Internacional actual. *Ius et Praxis*, 21(1), 449-502. <http://dx.doi.org/10.4067/S0718-00122015000100013>.
4. Restrepo, S. (2018). Las intervenciones humanitarias desde la doctrina de la Responsabilidad de Proteger. *Estudios de derecho*, 75(165), 151-175. <http://dx.doi.org/10.17533/udea.esde.v75n165a07>.
5. Archibugi, D. (2003). Directrices cosmopolitas para la intervención humanitaria. *Papeles de cuestiones internacionales*, (83), 25-37.
6. Casani, A., & Fernández-Molina, I. (2022). Repertorios de prácticas en la política turca hacia el conflicto de Libia y la intervención militar de 2020. *Revista de Estudios Internacionales Mediterráneos*, (33), 87-113. <https://doi.org/10.15366/reim2022.33.004>.
7. Brun, É., & Valette, M. F. (2016). Los fundamentos de la diversidad del Sur ante la intervención militar. *Foro internacional*, 56(1), 120-164.
8. Levitsky, S., & Murillo, M. V. (2020). La tentación militar en América Latina. *Nueva Sociedad*, (285), 4-11.

9. Valdivieso, W. V., Rodríguez, J. A. V., Villa, M. F. V., Reyes, E. R. R., & Montero, J. S. N. (2021). Assessment of Barriers to Access Public Services for Immigrants in Ecuador using a NeutroAlgebra-based Model. *Neutrosophic Sets and Systems*, 44, 53-60.
10. Arvelo, P. M. M., Zambrano, J. C. A., Robles, G. K., Zambrano, J. E. C. P., Pita, G. F. V., Carolina, D., ... & Paucar, C. E. P. (2019). Neutrosophic model for the analysis of criminal behaviour in Quevedo, Ecuador, from a spatial econometric analysis. *Neutrosophic Sets Syst*, 26, 48-53.
11. Biswas, P., Pramanik, S., & Giri, B. C. (2016). TOPSIS method for multi-attribute group decision-making under single-valued neutrosophic environment. *Neural computing and Applications*, 27, 727-737. <https://doi.org/10.1007/s00521-015-1891-2>.
12. Nabeeh, N. (2020). A hybrid neutrosophic approach of DEMATEL with AR-DEA in technology selection. *Neutrosophic Sets and Systems*, 31, 17-30.
13. Ricardo, J. E., Vázquez, M. Y. L., Banderas, F. J. C., & Montenegro, B. D. N. (2022). Aplicación de las ciencias neutrosóficas a la enseñanza del derecho. *Infinite Study*.
14. Ricardo, J. E., Vázquez, Á. B. M., Herrera, R. A. A., Álvarez, A. E. V., Jara, J. I. E., & Hernández, N. B. (2018). Management System of Higher Education in Ecuador. Impact on the Learning Process. *Dilemas Contemporáneos: Educación, Política y Valore*, (Special).

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