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Assessment of factors affecting land use planning and land use plans in Van Ho District, Son La Province, Vietnam

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Abstract

The study aims to identify the extent to which various factors influence land use planning and land use plans in Van Ho District, Son La Province. The research methods employed include: Exploratory Factor Analysis (EFA), data processing techniques, and Multi-Criteria Decision Analysis (MCDA) using the Analytic Hierarchy Process (AHP). Data analysis revealed the following results for the implementation of land use plans during the 2021–2023 period: (1) Agricultural land utilization reached 106.1%, 100.37%, and 102.1% over the three years, respectively; (2) Non-agricultural land utilization reached 85.35%, 87.15%, and 60.64% compared to the approved targets; (3) Unused land utilization only reached 34.71% in 2021 due to the COVID-19 pandemic, which affected the planned reclamation and conversion of unused land into agricultural, forestry, and non-agricultural production land (e.g., land for other annual crops, production forests). However, in 2022 and 2023, the utilization of unused land reached 108.77% and 124% of the approved targets, respectively. The study also conducted a survey of 150 respondents, including government officials at various levels and experts in land use planning, land management, finance, and related fields. The results identified five groups of factors influencing land use planning and planning activities in Van Ho District, with the following impact weights: (1) Legal and policy factors (0.426); (2) Economic factors (0.240); (3) Social factors (0.151); (4) Environmental factors (0.106); and (5) Other factors (0.077). Thus, policy and economic factors are of greatest concern, while other factors are considered less significant by experts. Identifying the influencing factors and their respective weights will contribute to proposing solutions that build on the achievements of land use planning and implementation, address current limitations, and enhance the effectiveness of land use planning and the role of state land management.

Keywords: Influencing factors, Land use planning, Multi-criteria method, Van Ho district.

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1. Introduction

"Land is a delineable area of the Earth's surface, encompassing all attributes of the biosphere immediately above or below this surface..." [1]. In Vietnam, land is considered a special national resource and an essential asset for national development, which must be managed in accordance with the law [2]. According to Vink [3], land resources directly affect people's livelihoods and almost all national activities. The rapid socio-economic development and increasing demand for land use have made land use planning and land use plans (LUPs) more urgent than ever.

Recognizing this, the Party and State of Vietnam have issued numerous legal documents, including Resolution No. 18-NQ/TW in 2022 by the Politburo. This resolution affirms the crucial role of land use planning in managing, allocating, and efficiently utilizing land resources to serve socio-economic development, national defense, security, and environmental protection [3].

"Land use planning is the systematic assessment of land and water potential, land use alternatives, and socio-economic conditions for the purpose of selecting and adopting the best land use options" [1]. Land use planning and land use plans (LUPs) are one of the 18 areas of State land management; they form the basis for land allocation, land lease, land use conversion permissions, and the issuance of land use rights certificates [4]. LUPs ensure the management and distribution of finite land resources for overall socio-economic development, for individual sectors, and for preservation for future generations [5]. In Vietnam, the process of developing and implementing land use plans has improved significantly and achieved positive results. However, there remain certain limitations, such as delays in the approval of district-level land use plans, low planning quality, and lack of land use coordination [6].

In practice, besides evaluating land use indicators, project implementation outcomes, and land use conversion during the planning period, identifying and determining the degree of influence of various factors on LUP implementation in the study area plays a vital role [7, 8]. Theoretical frameworks regarding factors influencing land use planning are typically developed through expert consultation or inherited from previous studies [8-10]. These influencing factors are generally categorized into three main groups: economic, social, and environmental [11, 12]. In addition, legal and policy-related factors and other miscellaneous factors also directly influence land use planning and should be incorporated into effectiveness evaluations [13]. Numerous studies have identified the major factor groups affecting LUPs as (i) legal and policy; (ii) economic; (iii) social; (iv) environmental; and (v) others, and have analyzed different aspects of these groups regarding land use.

O'Sullivan et al. [14] study focused on proposing integrated land management policies based on functional land use management theory to enhance land use efficiency [14]. The study by Vu [15] examined the impact of land fragmentation on agricultural production efficiency [15]. Both globally and in Vietnam, various methods have been used to assess the influence of these factors on land use, such as Delphi, AHP, ANP, and combined models of Exploratory Factor Analysis (EFA) with multiple regression [16, 17]. Among them, the use of EFA combined with multiple regression models to determine factor influence on land use is quite common [7, 8, 12, 15].

2. Study Area and Data

2.1. Study area

Van Ho is a newly established district, separated from Moc Chau District. It is located in the Southeast of Son La Province in the Northwest region of Vietnam, with a total natural area of 98,288.9 hectares. The district center is approximately 140 km southeast of Son La City and about 170 km northwest of the People's Committee of Son La Province [18].

This district holds a strategic position as a gateway connecting the Northwestern provinces with Hanoi and the Red River Delta through National Highway 6, a vital transportation route of the Northwest region. In accordance with the Land Law, the People's Committee of Van Ho District has developed a land use plan, which was approved by the People's Committee of Son La Province under Decision No. 1567/QĐ-UBND dated August 3, 2022, approving the district's land use planning to 2030. The district's land use plans for the years 2021, 2022, and 2023 were also prepared and approved in compliance with legal regulations.

Van Ho is considered a model district in Son La Province in terms of land use planning and implementation. Thanks to detailed planning, the district has achieved notable successes in socio-economic development, with land resources being used efficiently and contributing to environmental protection.

However, several challenges remain in the implementation process. Some land use targets have not been met; land allocation and leasing in certain areas have been inappropriate; compensation, support, resettlement, and land acquisition in some localities have been delayed; and there has been a lack of decisive action in handling delayed projects or land that has not been put into use. These issues need to be addressed to improve land management efficiency in the district.

2.2. Data Used

Data used to study factors affecting land use planning and plans in Van Ho District, Son La Province include: (1) The current status of land use, land use planning, and plans, as well as the results of the implementation of land use planning and plans of Van Ho District in the period of 2021-2023, through the results of land statistics of the district; (2) Statistics and socio-economic development orientations; (3) Survey questionnaire to consult with officials and experts on factors affecting land use planning and plans of Van Ho District. The study consulted 150 opinions from officials, residents, and 30 experts in the fields of land management, land use planning, and land economics, at the central and local levels.

3. Method (Ngọc)

3.1. Discovery Factor Analysis Method

The collected data is fed into the SPSS software for exploratory factor analysis, which includes two main steps:

Step 1: Test the reliability of the scale through the Cronbach's Alpha coefficient.

Perform scale testing with Cronbach's Alpha coefficient to eliminate non-conforming variables before using EFA. The Cronbach's Alpha coefficient of the sum variable in the group has a variable value in the paragraph [1] is evaluated as follows: From 0.7 – 0.8: Good scale, from 0.8 – 0.9: Very good scale, above 0.9: Completely good scale.

Observations are acceptable for use in research when the total variable correlation coefficient is greater than 0.3 [19-21] and has a Cronbach's Alpha coefficient greater than 0.6, which is suitable for further analysis steps [19].

Step 2: Exploratory Factor Analysis (EFA).

The main goal of EFA is to describe the relationship between a set of observable variables k (a smaller number) and non-observable variables [22].

These variables are only acceptable when the KMO (Kaiser-Meyer-OIKIN) appropriate coefficient is in the range of FAO Food and Agriculture Organization of the United Nations [1] and its own load weights at other factors are less than 0.35 [23] or the distance between two load weights (Factor Loading) of the same variable at two different factors is greater than 0.3. According to Hair, et al. [24] if a load weight of > 0.3 is selected, the sample size must be at least 350, if the sample size is about 100, a load weight of > 0.55 should be chosen, and if the sample size is about 50, the load weight must be > 0.75. For this study, the load weight chosen is > 0.55 because the survey sample size is 150. In addition, the scale is only accepted when the total variance explained > 50%; Barlett's coefficient with a significance level (Sig. < 0.05) to ensure that the factors are correlated with each other in the whole; The Eigenvalue coefficient has a value of > 1 to ensure that the groups of factors are different.

3.2. Data Processing Methods

Analysis of the collected data on the actual status of formulation and implementation of land planning and planning is evaluated through 2 groups of criteria: (1) Land use targets are evaluated through a comparison of the area between the implementation results and the approved land planning and planning, including comparison of absolute value (by ha area) and relative comparison (percentage). The percentage is divided into groups according to the difference ratio d (d is calculated by the absolute value of the difference between the implementation rate and the QH) with 5 evaluation levels, corresponding to 5 points: |d| <10%: very good level; |d| = 10% - <20%: good level; |d| = 20.01% - < 30%: average; |d| = 30.01% - < 40%: poor and |d| > 40%: very poor;

3.3. Multi-Criteria Analysis Method Using AHP Hierarchical Analysis Technique

The method is implemented to determine the impact of factors affecting the implementation of land use planning and plans. The determination of the impact of factors is based on the foundation of the multi-criteria assessment method (MCE), using the individual hierarchical analysis tool (AHP-IDM) by Saaty [25]. However, in order to limit the subjectivity of experts, the study conducted a hierarchical analysis in group decision-making (AHP-GDM) [26, 27]. The group decision-making method (AHP-GDM) is carried out with the following basic steps:

+ Step 1: Identify the influencing factors. Factors affecting the results of the implementation of land use planning and plans are determined through the consultation of domestic and foreign research works and consultation with experts who are knowledgeable in the field of land management and land use planning. including the following groups: (1) groups of legal and policy elements (including (i) state guidelines and policies, (ii) synchronization between plannings, (iii) regulations on regional linkage and environmental protection and sustainable development); (2) groups of economic factors (including (i) economic structure, economic restructuring, (ii) consumption market; (iii) funding sources); (3) groups of social factors (including (i) local development needs, (ii) population, intellectual level, (iii) resettlement of people subject to land recovery, (iv) vocational training, (v) customs and practices, (vi) social consensus); (4) groups of environmental factors (including (i) natural conditions, (ii) environment, natural ecosystems, (iii) climate change), (5) other factors (including (i) development orientation vision, (ii) professional qualifications and capacity of officials, (iii) systems of documents and databases for the planning process, land use plan).

+ Step 2: Determine the weights

Determining the weights for the indicators is very important in assessing the rationality of the spatial location of the planning plan. An assessment plan needs a lot of indicators, but not all indicators are the same. The vast majority of cases are different and it is necessary to determine their relative importance. The weighting of the indicators can be calculated through statistical algorithms, measurements, or based on the subjective experience and understanding of experts. The Analytical Hierarchy Process (AHP), developed by Saaty [27] and Saaty [25], is a decision-making technique in which there are a finite number of options, but each option has different characteristics that make it difficult to decide.

This model is especially useful when making decisions in a working group. AHP can help identify and quantify criteria, analyze data collected against those criteria, and promote faster, more accurate decision-making. It helps to consider and measure both subjective and objective factors, creating a useful mechanism to ensure consistency in the evaluation and measurement of solutions and proposals made within the working group.

When different indicators have the same level of importance, the weight of each factor is equal to 1. However, in the vast majority of cases, they are different, and it is necessary to determine their relative importance. The weighting of the indicators can be calculated through statistical algorithms, measurements, or based on the subjective experience and understanding of experts.

The AHP process is based on a series of pairs comparing criteria against each other, which are then combined. An AHP process can be summarized into the following 4 main steps [25]:

1. Decompose some non-structural situations into small components.

2. Arrange the components or indicators in a hierarchical order.

3. Assign values to subjective comparisons of the importance of indicators. This comparison is made between pairs of indicators and is summed up into an n-level square matrix, where the element a_{ij} represents the importance of the indicator in row i compared to the indicator in column j. The importance of the indicators is assessed based on the opinions of experts on a scale as shown in Figure 2. Figure 3 illustrates the importance matrix with the number of indicators n = 3. X is the name of the indicators.

4. Calculate and synthesize the results to determine the importance of the indicators. The simplest way to do it is as follows:

- Standardize the importance of the indicators by dividing the values of the cells in each column by the total value of that column. (Fig. 3b)
- Calculate the average value of each line in the matrix to give the corresponding weights of the indicators.

The image represents a scale with various levels of importance. Here's the English translation:

1/9: Not important at all
1/7: Very unimportant
1/5: Unimportant
1/3: Somewhat unimportant
1: Neutral (equally important and unimportant)
3: Somewhat important
5: Important
7: Very important
9: Extremely important

This scale seems to be designed to measure the level of importance, ranging from "Not important at all" to "Extremely important."

Consider an example comparing the importance of criteria X1, X2, and X3:

- X1 compared to X2 = 1/3 (X2 is more important than X1)
- X1 compared to X3 = 5 (X1 is much more important than X3)
- X2 compared to X3 = **7** (X2 is significantly more important than X3)

Table 1.
Examples of the importance of indicators and how weighting is calculated

a. Importance Level Matrix			
	X1	**X2**	**X3**
X1	1	4-Jan	5-Jan
X2	4	1	1
X3	5	1	1
Total	10	2.25	2.2
b. Normalized Matrix			
	X1	X2	X3
X1	0.1	0.111	0.091
X2	0.4	0.444	0.445
X3	0.5	0.444	0.445
Total	1	1	1
c. Overall Weights			
X1		0.101	
X2		0.433	
X3		0.466	

The matrix of the importance of indicators is usually built on the basis of expert opinions. For this matrix, the following issues should be paid attention to:

- First: This is a matrix that depends on the subjective opinion of the decision-maker. For example, the X1 indicator is more important than the X2 indicator, but how many times the value is important may depend on each person.
- Second: It is necessary to consider the consistency of the evaluation. That is, if X2 is 3 times more important than X1 and X1 is 5 times more important than X3, then in mathematics, X2 will be 15 times more important than X3. However, expert opinion in practice will not be the case because they do not cover the logic of the comparison matrix (nor should they try to cover it to ensure the objectivity of the evaluation).

To evaluate the consistency of the results, the Consistency Ratio (CR) is used according to the following formulas:

$$CR = \frac{CI}{RI} \qquad (1)$$

CI: Consistency Index
RI: Random Index

$$CI = \frac{\lambda max - n}{n-1} \qquad (2)$$

λmax: Characteristic value of the importance matrix
n: number of indicators (in the example above n = 3)

$$\lambda\, max = \frac{1}{n} \times \left(\frac{\sum_{i=1}^{3} w_{1i}}{w_{11}} + \frac{\sum_{i=1}^{3} w_{2i}}{w_{22}} + \frac{\sum_{i=1}^{3} w_{3i}}{w_{33}} + \ldots \right) \qquad (3)$$

Wij: the value of the normalized indicators of row *i* column *j*

For each n-level comparison matrix, T.L. Saaty experimented with generating random matrices and calculating their average CI and called it RI - the stochastic index (Table 1).

Table 2.
The RI value corresponds to each number of indicators n

n	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49

If the CR consistency score value < 0.1 is acceptable, if it is greater requires the decision maker to reduce the heterogeneity by changing the importance value between indicator pairs.

4. Research Process

The process of studying and evaluating factors affecting land use planning and plans in Van Ho district is as follows:

5. Results

5.1. Results of Implementation of Land Use Planning and Plans for the 2021-2023 Period in Van Ho District

The results of data synthesis show that in the period from 2021-2023, the results of the implementation of land use plans for agricultural land are quite high (all over 100%). Non-agricultural land in 2023 is relatively low (reaching 60.64%), unused land in 2023 is 124% higher than in 2021, only reaching 34.71% (Table 2).

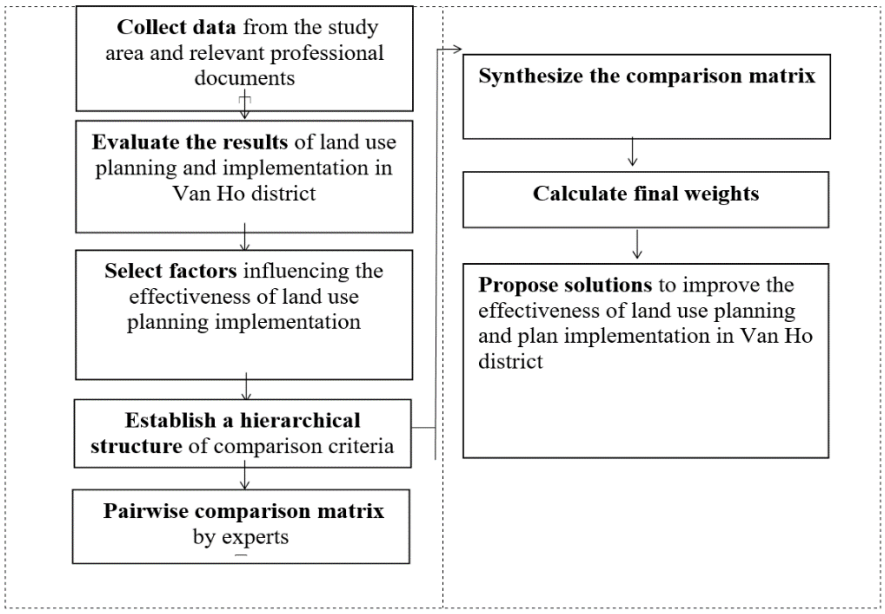

Figure 1.
The process of assessing factors affecting land use planning and plans in Van Ho district.

Table 3.
Results of implementation of the land use plan in 2021-2023 in Van Ho district.

No.	Category	2021				2022				2023		
	Planned (ha)	Actual (ha)	Rate (%)	Diff (±%)	Planned (ha)	Actual (ha)	Rate (%)	Diff (±%)	Planned (ha)	Actual (ha)	Rate (%)	Diff (±%)
1	Agricultural Land	86,781.22	92,095.74	106.1	6.1	91,703.16	92,045.42	100.37	0.37	90,123.11	92,041.19	102.1
1.1	Rice cultivation land	1,912.95	1,938.37	101.33	1.33	1,929.08	1,937.78	100.45	0.45	1,876.76	1,937.77	103.25
1.2	Other annual crops land	25,899.92	30,749.86	118.73	18.73	30,072.81	30,756.25	102.27	2.27	27,452.25	30,574.89	111.37
1.3	Perennial crops land	4,139.31	4,163.33	100.58	0.58	4,444.83	4,165.03	93.71	-6.29	4,977.52	4,163.53	83.65
1.4	Protection forest land	14,658.27	13,863.52	94.58	-5.42	13,857.62	13,863.50	100.04	0.04	13,888.04	13,862.93	99.82
1.5	Special-use forest land	13,738.97	13,125.00	95.53	-4.47	13,124.99	13,066.66	99.56	-0.44	13,124.99	13,121.66	99.97
1.6	Production forest land	26,308.71	28,138.93	106.96	6.96	28,158.32	28,139.15	99.93	-0.07	28,653.56	28,263.37	98.64
1.7	Aquaculture land	30.37	63.97	210.66	110.66	58.06	64.19	110.55	10.55	51.85	64.19	123.79
1.8	Other agricultural land	30.37	63.97	57.02	-42.98	57.45	52.87	92.03	-7.97	98.13	52.87	53.88
2	Non-agricultural Land	4,344.15	3,707.06	85.35	-14.65	4,255.26	3,708.67	87.15	-12.85	6,122.52	3,712.90	60.64
2.1	National defense land	208.42	206.75	99.2	-0.8	209.58	205.93	98.26	-1.74	210.48	205.98	97.86
2.2	Security land	1.99	2.42	121.71	21.71	14.93	2.42	16.19	-83.81	17.06	3.57	20.91
2.3	Commercial-service land	41.41	13.75	33.2	-66.8	18.05	15.72	87.12	-12.88	806.22	18.65	2.31
2.4	Non-agricultural production land	40.32	32.5	80.62	-19.38	32.5	32.5	100	0	37.51	32.5	—
2.5	Mining land	88.46	46.52	52.59	-47.41	46.52	46.52	100	0	364.12	46.52	86.7
2.6	Infrastructure development land (national/provincial/district/commune level)	2,461.44	2,057.90	83.61	-16.39	2,720.05	2,273.31	83.58	-16.42	4.07	4.07	12.8
2.7	Land with historical-cultural relics	2,697.12	2,697.12	100	0	2,720.05	2,273.31	83.58	-16.42	2,836.32	2,273.28	100
2.8	Waste treatment land	8	4.7	58.76	-41.24	31.8	31.8	100	0	156.17	125.17	80.15
2.9	Rural residential land	587.86	461.43	78.49	-21.51	521.41	464.64	89.11	-10.89	793.27	464.69	—
2.10	Government office land	20.96	19.78	94.4	-5.6	19.58	19.78	101.02	1.02	20.2	19.86	58.58
2.11	Institutional office land	6.27	3.77	60.11	-39.89	5.68	5.68	100	0	6.68	5.68	98.31
2.12	Cemetery/cremation facility land	209.73	209.04	99.67	-0.33	0.45	0.45	100	0	—	—	—
2.13	Building materials/ceramics land	11.91	4.07	34.2	-65.8	4.07	4.07	100	0	4.07	4.07	100
2.14	Belief site land	0.16	0.46	284.38	184.38	0.45	0.45	100	0	0.45	0.45	102.76
2.15	Rivers, canals, streams land	635.45	632.35	99.51	-0.49	625.35	632.35	101.12	1.12	615.34	632.35	10.35
2.16	Specialized water surface land	—	3.86	—	—	3.85	3.85	100	0	37.19	3.85	100
2.17	Other non-agricultural land	21.52	1.45	60.74	-39.26	1.45	1.45	100	0	1.45	1.45	100
3	Unused Land	7,163.52	2,486.11	34.71	-65.29	2,330.49	2,534.82	108.77	8.77	2,043.28	2,534.82	124

The area of agricultural land approved according to the plan in 2021, 2022, and 2023 is 86,781.22 hectares, 91,703.16 hectares, and 90,123.11 hectares, respectively; the area is still higher than the plan of 92,095.74 hectares, 92,045.42 hectares, and 92,041.19 hectares, which have not been repurposed according to the plan. The respective figures are 5,314.52 hectares, 342.26 hectares, and 1,918.08 hectares, which correspond to 6.1%, 0.37%, and 2.1%, respectively. These figures reflect the same trends as the research results in Dien Bien Dong district, Dien Bien province [13, 15]. Evaluation according to the comparison of the difference ratio d shows that in 2021, there are 5 out of 8 targets implemented at a very good level |d| < 10%; 1 out of 8 implementation targets at a good level |d| = 10% - 40%. The reason for the very poor target achievement is that aquaculture land is expected to be converted to traffic land, but due to the Hoa Binh – Moc Chau and Son La highway projects being behind schedule, they have not been converted to PNN land. However, by 2022, this target has been significantly improved.

In 2022, there are 07/08 targets implemented at a very good level |d| <10%; 01/08 Implementation targets at a good level |d| = 10% - <20%; In 2023, 04/08 targets will be implemented at a very good level |d| <10%; 02/08 Implementation targets are at a good level |d| = 10% - <20%; 01/08 Implementation targets at an average level |d| = 20.01% - < 30% and 01/08 implementation targets are very poor |d| > 40; the reason for the very poor target is the high-tech agricultural plant nursery project (STEVIA TB Agricultural Products Joint Stock Company); The project of breeding sows, commercial pigs and planting fruit trees in Van Ho has not been implemented.

Non-agricultural land: According to the approved plans in 2021, 2022 and 2023, respectively, it is 4344.15 hectares; 4255.26 hectares and 6122.52 hectares of PNN land, respectively, the area of PNN land is 3707.06 hectares, 3708.67 hectares and 3712.90 hectares, which is 637.09 hectares, 546.59 hectares and 2409.62 hectares, respectively, reaching 85.35%; 87.15% and 60.64% of the approved plan targets, corresponding to the research results in Dien Bien Dong district, Dien Bien province with an implementation rate of 78.84% of the plan [13] and lower than Luc Ngan district, Bac Giang province [15] with an implementation rate of over 90.0% and Tho Xuan district, Thanh Hoa province [14] with an implementation rate of 94.07% of the plan [14]. Comparative assessment of the difference ratio d: In 2021, 07/17 targets were implemented at a very good level |d| <10%; 02/17 targets were implemented at a good level |d| = 10% - <20%; 02/17 targets were implemented at an average level |d| = 20.01% - < 30%; 02/17 targets were implemented at a very poor level |d| = 30.01% - < 40% and 04/17 targets were implemented at a very poor level |d| > 40%. In 2022, there are 12/17 targets implemented at a very good level |d| <10%; 04/17 targets are implemented at a good level |d| = 10% - <20%; 02/17 targets are implemented at an average level |d| = 20.01% - < 30% and 01/17 targets are implemented at a very poor level |d| > 40%. In 2023, 09/17 targets are implemented at a very good level |d| <10%; 02/17 targets are implemented at a very good level |d| = 10% - <20%; and 06/17 targets are implemented at a very poor level |d| > 40%. The reason is that the province has not allocated capital for construction works that have been included in the plan. In addition, investors are also limited in capital sources, so they have not well implemented the targets registered in the land use plan, affecting the results of the implementation of land targets for production and business, trade and services and residential land.

- Unused land: The approved area in 2021, 2022 and 2023 is 7163.52 hectares; 2330.49 hectares and 2043.28 hectares, respectively; 2486.11 hectares, 2534.82 hectares and 2534.82 hectares, respectively, lower than 4677.41 hectares in 2021 and 204.33 hectares in 2022 and 491.54 hectares in 2023, respectively higher than the approved plan targets. The reason in 2021 is much lower than the approved target due to the development of a plan for reclamation and restoration to put unused land into use for agricultural, forestry and non-agricultural production purposes, such as land for planting other annual crops, production forest land, but has not been implemented due to the epidemic.

5.2. Factors Affecting the Results of the Implementation of the Land Use Plan of Van Ho District

5.2.1. Selection of Influencing Factors

On the basis of analyzing the results of the implementation of the district's land planning and planning, comparing with the characteristics of natural conditions, natural resources, and socio-economic conditions, the research team has developed a set of indicators affecting the results of the implementation of the planning and land planning of Van Ho district. Conducting consultation on 150 survey questionnaires in the locality, including the following subjects: managers, people and people who are knowledgeable in the formulation and implementation of land use plans in Van Ho district. On that basis, it is expected that the factors affecting the results of the implementation of land use planning and plans are as follows (Table 5).

Table 4.
Identification of Factors Affecting the Implementation Results of Land Use Planning and Land Use Plans (LUPs).

Primary Factor Groups	Code	Secondary-Level Factors
Legal and Policy Factors	CS1	(1) Consistency among various planning frameworks
	CS2	(2) Government policies and orientations related to land use planning
	CS3	(3) Regulations on regional connectivity, environmental protection, and sustainable development in the planning process
Economic Factors	KT1	(4) Budget for land use planning (development, implementation, adjustment)
	KT2	(5) Market demand and consumption
	KT3	(6) Economic structure and structural transformation
Social Factors	XH1	(7) Local development needs
	XH2	(8) Population, education level, etc.
	XH3	(9) Resettlement for people affected by land acquisition
	XH4	(10) Public consensus and social acceptance
	XH5	(11) Customs and traditions
	XH6	(12) Vocational training and employment
Environmental Factors	MT1	(13) Natural conditions (geographic location, terrain, climate, hydrology, soil, etc.)
	MT2	(14) Environment and natural ecosystems
	MT3	(15) Climate change
Other Factors	K1	(16) Vision and development orientation
	K2	(17) Professional qualifications and capacity of staff involved in planning and implementation
	K3	(18) Documentation and database systems supporting the land use planning process

5.2.1.1. Scale Reliability Testing Using Cronbach's Alpha

To ensure the reliability of the factors affecting land use planning and implementation, a statistical test was conducted using Cronbach's Alpha coefficient and item-total correlation.

Table 5.
Reliability Test Results of Variable Groups' Measurement Scales

No.	Code	Corrected Item–Total Correlation	Cronbach's Alpha if Item Deleted
1. Legal and Policy Factors (Cronbach's Alpha = 0.859)	CS1	0.739	0.781
	CS2	0.781	0.745
	CS3	0.661	0.853
2. Economic Factors (Cronbach's Alpha = 0.825)	KT1	0.652	0.791
	KT2	0.771	0.673
	KT3	0.630	0.810
3. Social Factors (Cronbach's Alpha = 0.914)	XH1	0.710	0.905
	XH2	0.798	0.892
	XH3	0.833	0.887
	XH4	0.767	0.897
	XH5	0.704	0.906
	XH6	0.737	0.901
4. Environmental Factors (Cronbach's Alpha = 0.904)	MT1	0.656	0.890
	MT2	0.897	0.786
	MT3	0.890	0.793
	K1	0.894	0.822
	K2	0.917	0.801
	K3	0.693	0.881

The results of the scale quality analysis presented in Table 4 show that all 18 observed variables, grouped into five independent factor groups, satisfy the conditions for reliability. The Cronbach's Alpha values range from 0.6 to 0.95, and the Corrected Item–Total Correlation coefficients are all greater than 0.3. Therefore, no observed variable was eliminated. These results indicate that the measurement scales have good reliability with the full set of 18 variables.

2. Exploratory factor analysis (EFA) and selection of influential factors

To verify the accuracy of the selected factors in the measurement scales, Exploratory Factor Analysis (EFA) was conducted using Principal Component Analysis as the extraction method and Varimax rotation with Kaiser normalization. The results are presented in Table 5:

Table 6.
KMO and Bartlett's Test of Sampling Adequacy.

KMO Value	0,817	
Bartlett's Test of Sphericity	**Chi-Square**	2173.321
	Degrees of Freedom (df)	153
		0.000

The KMO test result falls within the acceptable range ($0.5 < 0.817 < 1.0$), indicating that the selected variables are suitable for Exploratory Factor Analysis (EFA). Furthermore, Bartlett's Test of Sphericity shows Sig. = $0.000 < 0.05$, which is statistically significant, demonstrating that the observed variables are highly correlated within each factor.

Table 7.
Rotated Component Matrix

		Component 1			
Variable	**1**	**2**	**3**	**4**	**5**
XH3	0.860				
XH2	0.839				
XH4	0.835				
XH6	0.796				
XH5	0.775				
XH1	0.769				
K2		0.943			
K1		0.936			
K3		0.825			
MT2			0.950		
MT3			0.949		
MT1			0.770		
CS2				0.860	
CS1				0.847	
CS3				0.788	
KT2					0.854
KT1					0.792
KT3					0.732

The results obtained in the correlation matrix in Table 4 show that all variables have a high degree of positive relationship with each other. The load factor of 0.732 to 0.950 is greater than 0.5. It can be affirmed that each criterion in each group of criteria has a correlation with the group of criteria of which that criterion is a component and has practical significance. Thus, 5 groups of independent variable criteria and 18 observation components are appropriate in the analysis. The EFA exploratory factor analysis confirms that 5 groups of corresponding criteria (Table 2) are included in the regression analysis.

5.2.2. Calculation of Weighting of Factors

In order to determine the weight of each group of factors affecting the planning and land use plan of Van Ho district, the study conducted a matrix to compare the importance between groups of factors from 3 groups of experts including (1) group 1 including experts working at the commune level (10 people), (2) Group 2 includes experts working at the district level (10 people), (3) Group 3 includes experts working at the provincial level (10 people). From the results of evaluating the importance of the factors, the matrix is normalized, the λmax value is calculated, and the CR consistency ratio is checked

Conducting the establishment of hierarchical hierarchy between factors, independent evaluation experts (k matrix comparison of pairs of k experts).

$a_{jik} = 1/a_{ijk}$; $a_{ijk} \in$ [19].

The importance matrix is calculated based on evaluations by expert groups. For example, for Group 1, as illustrated in Figure 3, the results are as follows:

Table 8.
Normalized Importance Weights of Factors as Evaluated by Expert Group 1.

Importance Level Matrix					
	Policy	**Economy**	**Society**	**Environment**	**Others**
Policy	1.0	3.0	4.0	4.0	4.0
Economy	0.3	1.0	2.0	3.0	5.0
Society	0.3	0.5	1.0	2.0	3.0
Environment	0.3	0.3	0.5	1.0	2.0
Others	0.3	0.2	0.3	0.5	1.0
Total	2.1	5.0	7.8	10.5	15.0

Normalized Matrix						
	Policy	Economy	Society	Environment	Others	Total
Policy	0.480	0.595	0.514	0.381	0.267	2.236
Economy	0.160	0.198	0.251	0.286	0.333	1.228
Society	0.120	0.102	0.128	0.190	0.200	0.741
Environment	0.120	0.066	0.064	0.095	0.133	0.479
Others	0.120	0.040	0.043	0.048	0.067	0.317
Total	1.000	1.000	1.000	1.000	1.000	

Weights

- Policy: 0.447
- Economy: 0.246
- Society: 0.148
- Environment: 0.096
- Others: 0.063

According to formulas 1.3, 1.4 and 1.5, we calculate the consistency index as follows:

$$CR = \frac{CI}{RI}$$

$$CI = \frac{\lambda\max - n}{n - 1}$$

Wij: the value of the normalized indicators of row *i* column *j*

Thus, with n = 5 we have RI = 1.111

$$\lambda\max = \frac{1}{n} x \left(\frac{\sum_{i=1}^{5} w_{1i}}{w_{11}} + \frac{\sum_{i=1}^{5} w_{2i}}{w_{22}} + \frac{\sum_{i=1}^{5} w_{3i}}{w_{33}} + \frac{\sum_{i=1}^{5} w_{4i}}{w_{44}} + \frac{\sum_{i=1}^{5} w_{5i}}{w_{55}} \right)$$

λmax =5.279

CI = 0.07. So the CR index = 0.063 <0.1 completely satisfies the condition, so the result achieves the weighted vector: [WCS WKT; WXH; WMT; WK] = 0.447; 0.246; 0.148; 0.096; 0.063].

Similarly, we have the weighting of the influence of the factors assessed by group 2 and group 3 experts, which is shown in

Table 9.
Average weighted values of groups of influencing factors

	Group 1	**Group 2**	**Group 3**	**Average weighting**
Policy	0.447	0.406	0.424	0.426
Economic	0.246	0.259	0.214	0.240
Society	0.148	0.141	0.164	0.151
Environment	0.096	0.105	0.118	0.106
Different	0.063	0.089	0.079	0.077
CR	0.063	0.086	0.074	

Thus, the results of multi-index analysis for 5 groups of factors show that the group of policy factors and the group of economic factors have the strongest impact on land use planning and plans with weights of 0.426 and 0.240, respectively. Other factors are considered to have the least impact on land use planning and plans with a weight of 0.077.

Table 10.
Impact of factors affecting the results of land use plan implementation in Van Ho district

No.	Level 1 Factor	Weights (W1)	No.	Secondary Factor	Weights (W2)	Global Weights (W1*W2)
1	Policy	0.426	1	CS1	0.5773	0.2458
			2	CS2	0.3072	0.1308
			3	CS3	0.1155	0.0492
2	Economic	0.240	4	KT1	0.6080	0.1456
			5	KT2	0.2721	0.0652
			6	KT3	0.1199	0.0287
3	Society	0.151	7	XH1	0.1440	0.0218
			8	XH2	0.2388	0.0361
			9	XH3	0.1266	0.0191
			10	XH4	0.2147	0.0325
			11	XH5	0.1258	0.0190
			12	XH6	0.1501	0.0227
4	Environment	0.106	13	MT1	0.6863	0.0729
			14	MT2	0.2922	0.0311
			15	MT3	0.1167	0.0124
5	Different	0.077	16	K1	0.6431	0.0830
			17	K2	0.2283	0.0294
			18	K3	0.1286	0.0166

Thus, the implementation of the land use plan is affected by many policy factors; the weight of the influence of the factors is [WCS1, WCS2; WCS3] is [0.2458, 0.1308, 0.0492]. Corresponding to the factor of synchronization between plannings (CS1) accounting for the highest proportion in this group of 0.2458, the factor of state guidelines and policies related to land use planning and plans (CS2) accounting for the most important proportion (0.1308), the factor of regulations on regional linkage and environmental protection, sustainable development in land use planning (CS3) by 0.0492. This is completely consistent with the reality that whether the planning of land use plans can be implemented well or not, it must ensure the synchronization between the planning guidelines and cannot be separated from the current policy guidelines, especially in the context of sustainable development that is currently being concerned.

We see that in the group of economic factors, the factor that needs the most attention is the factor of funding for the implementation of land use planning (KT1), accounting for 0.1456; the market factor (KT2) has a proportion of 0.0652, and the economic restructuring factor (KT3) has the lowest proportion of 0.0287. In fact, the works implemented in recent years, when executed, are limited in terms of investment capital, thereby leading to delays compared to the approved land use plan.

In addition, social factors also dominate the results of the implementation of land use plans, in which population, people's intellectual level (XH2) and social consensus (XH4) account for the proportion of interest more than 0.0361 and 0.0325, respectively. The rest of society is less concerned

The environmental factor is also one of the influencing factors, but it is less concerned than the above factors, in which the natural condition factor (MT1) is more appreciated than the environmental factor, natural ecosystem (MT2) and climate change (MT3) factors

In contrast to the above factors, other factors are of little interest to experts, experts believe that the development-oriented vision (K1) and the professional qualifications and capacity of officials serving the construction and organization of the implementation of land use plannings and plans (K2) and have a greater influence account for the proportion of 0.0830 and 0.0294 respectively compared to the system Database documents serving the process of making land use planning and plans (K3) only account for a small proportion of 0.0166.

6. Discussion

6.1. Shortcomings And Difficulties of the Implementation of Land Use Planning and Plans in Van Ho District

6.1.1. Regarding policy guidelines

The exercise of land users' rights in accordance with the provisions of the Land Law and the provisions of administrative procedures has not yet met the needs of land users, and there is still a situation of arbitrary transfer and change of land use purposes illegally.

The implementation of the Laws also overlaps, making it difficult to implement land use planning and plans in localities.

The promulgation of regulatory documents has not shown the role and participation of parties involved in the formulation and implementation of land use planning, there has been no coordination between agencies, departments and branches. There are no clear and specific regulations in cases of administrative violations.

6.1.2. Regarding Funding Sources

The settlement and disbursement of the state budget, as well as the provision of financial sources for investors are still slow and ineffective; investment capital for the implementation of land use planning and plans has not been ensured.

Investment resources for the implementation of works and projects are still lacking initiative and facing many difficulties, which affects the implementation progress, slow compared to the plan. Many projects are slow to implement due to land acquisition and site clearance, which also reduces the feasibility of implementing land use planning.

Compensation and site clearance in some locations with planning items are facing many difficulties, slowing down the construction progress... The results of non-agricultural land implementation are low compared to the planning target.

Some work items have been included in the land use plan targets, but the investor agency has not completed the project and land dossier, so the implementation schedule must be postponed.

6.2. Solutions to Enhance the Effectiveness of Land Use Planning and Implementation in Van Ho District

6.2.1. Policy and Regulation Adjustments

To improve land use planning effectiveness in Van Ho District, it is essential to introduce policies that attract investment, such as reducing land lease fees, lowering bank interest rates, and creating a reserve of available land for investors. These measures would help facilitate investor access and encourage their participation in land use planning, while ensuring a balanced benefit among local communities, investors, and the government. At the same time, overlapping legal frameworks should be reviewed and revised to ensure alignment with practical realities at the local level. Provincial People's Committees should issue specific guidelines that clarify the roles and responsibilities of all stakeholders involved in the development and implementation of land use plans. District-level authorities, in turn, need to develop and enforce effective coordination mechanisms between relevant agencies to ensure consistency and clarity in executing the plans. Additionally, penalties for investors or individuals who delay or fail to implement registered land use needs should be strengthened, such as fines, project revocation, or restrictions on participating in future land use requests within the district or province.

6.2.2. Financial Solutions

Financial support policies should be improved, especially interest-free loans for agricultural development. There is also a need for solutions that expedite state budget finalization, disbursement processes, and the timely delivery of funds to project owners. Local agencies should work in unison to develop land use plans while ensuring adequate financial resources to implement them according to schedule. District-level People's Committees must assess the feasibility of proposed projects before including them in the land use plan, with a clear indication of funding sources.

6.2.3. Organizational and Monitoring Improvements

Land use plans that have been approved should be widely publicized via mass media and accompanied by outreach and legal education efforts at the grassroots level. This helps raise public awareness about lawful and planned land use and prevents violations of land regulations. It is important to allocate land use planning targets to individual communes so that localities can develop land use plans through 2030, including the 2024 plan, in a synchronized manner with district-level plans. Dissemination and education efforts should be strengthened, especially concerning compensation, support, and resettlement regulations. Engagement between businesses and local people should be encouraged, particularly in promoting investor-land user negotiations in accordance with legal provisions.

6.2.4. Human Resources and Capacity Building

Attention must be paid to project proponents, particularly those with approved investment decisions or detailed planning. Only individuals or organizations with verified investment capacity should be permitted to implement projects in a given planning year. Moreover, the competence of consulting units responsible for developing land use plans must be assessed to avoid delays in the planning process, which could adversely affect implementation. Lastly, raising public awareness and encouraging community involvement in both the formulation and execution of land use plans is essential for achieving better outcomes.

7. Conclusions

This study provides a comprehensive review of relevant literature and analyzes secondary data sources to assess the factors influencing the implementation of land use planning and land use plans (LUPs) in Van Ho District. Based on survey data from 150 local managers and residents, as well as 30 experts, and through the application of scale reliability testing and analytical methods, the study successfully identified five primary factor groups and 18 secondary-level factors that significantly affect the effectiveness of land use plan implementation. Among the primary groups, legal and policy factors were recognized by experts as the most influential, with a weight of 0.426, followed by economic factors (0.240) and social factors (0.151). Environmental and other factors were considered less influential, with weights of 0.106 and 0.129, respectively.

The results of the land use plan implementation during the 2021–2023 period indicate a gradual improvement in performance, with implementation increasingly aligned with the practical needs of local residents. However, challenges remain most notably limitations in capital allocation, financial constraints among project investors, and an overall shortage of investment funds.

Identifying and quantifying the influence of these factors provides a valuable foundation for proposing targeted solutions that aim to build on the successes achieved thus far while addressing ongoing limitations. This, in turn, will help enhance the efficiency and effectiveness of land use planning and implementation, as well as strengthen land governance and state management in Van Ho District in particular, and Son La Province more broadly.

The study proposes four key solutions to improve the implementation of land use planning: (1) Policy and Regulatory Improvements – including measures to attract investment and harmonize legal frameworks; (2) Financial Solutions – ensuring timely and adequate funding for planning and implementation processes; (3) Organizational and Monitoring Enhancements – strengthening public communication, legal awareness, and plan coordination at all levels; (4) Human Resource Development – improving the capabilities of planners, local authorities, and community engagement in land use management.

References

[1] FAO Food and Agriculture Organization of the United Nations, *Guideline for land use planning (FAO Development Series No. 1)*. Rome, Italy: FAO, 1993.

[2] National Assembly of Vietnam, "Constitution of the socialist republic of Vietnam," National Assembly of Vietnam, 2013.

[3] A. P. A. Vink, *Land resources. In Land use in advancing agriculture*. Berlin, Heidelberg: Springer, 1975.

[4] National Assembly of Vietnam, "Land law," National Assembly of Vietnam, 2024.

[5] Central Committee of the Communist Party of Vietnam, "Resolution No. 18-NQ/TW dated June 16, 2022 on continuing the renewal and improvement of institutions and policies to enhance land management and use efficiency," Central Committee of the Communist Party of Vietnam, 2022.

[6] Ministry of Natural Resources and Environment, "Report No. 115/BC-BTNMT dated September 26, 2022 on the implementation status of the Land Law," Ministry of Natural Resources and Environment, 2022.

[7] P. N. Pham, T. T. H. Phan, and V. H. Pham, "Factors affecting the management of public agricultural land fund in Gia Lam District, Hanoi City, Vietnam," *Land Use Policy*, vol. 101, p. 105151, 2021.

[8] T. H. Phan and M. T. Nguyen, "Determining factors affecting land use planning in Can Tho city from the perspective of land users," *Can Tho University Journal of Science*, vol. 57, pp. 23–32, 2021. https://doi.org/10.22144/ctu.jvn.2021.082

[9] S. Aremu and S. Medayese, "Assessment of factors affecting urban planning and physical development in South-Western Nigeria," *Advances in Multidisciplinary & Scientific Research*, vol. 2, pp. 17–30, 2016. https://doi.org/10.22624/AIMS/V2N4P2

[10] Q. M. Vo and A. T. Luu, "Analysis of factors affecting the implementation of land use planning and plans in Can Tho City under the support of GIS," in *Proceedings of the National GIS Conference*, 2015.

[11] P. Gao, Y. Li, J. Gong, and G. Huang, "Urban land-use planning under multi-uncertainty and multiobjective considering ecosystem service value and economic benefit-A case study of Guangzhou, China," *Ecological complexity*, vol. 45, p. 100886, 2021.

[12] A. T. Le and Q. M. Vo, "Analysis of factors affecting land use planning implementation in Can Tho city supported by GIS," in *Proceedings of the National GIS Conference*, 2015, pp. 463–467.

[13] H. Kinuthia, C. Majale, and S. Letema, "Influence of public policy planning on peri-urban land speculation in (Greater) Eastern Bypass in Nairobi Metropolitan," *Land Use Policy*, vol. 107, p. 105515, 2021. https://doi.org/10.1016/j.landusepol.2021.105515

[14] L. O'Sullivan, D. Wall, R. Creamer, F. Bampa, and R. P. Schulte, "Functional Land Management: Bridging the Think-Do-Gap using a multi-stakeholder science policy interface," *Ambio*, vol. 47, pp. 216-230, 2018. https://doi.org/10.1007/s13280-017-0983-x

[15] K. L. Vu, "Factors affecting land use planning management in Hanoi City," *Journal of State Management*, 2024.

[16] V. Y. Chen, H.-P. Lien, C.-H. Liu, J. J. Liou, G.-H. Tzeng, and L.-S. Yang, "Fuzzy MCDM approach for selecting the best environment-watershed plan," *Applied Soft Computing*, vol. 11, no. 1, pp. 265-275, 2011.

[17] S. Perveen, M. Kamruzzaman, and T. Yigitcanlar, "What to assess to model the transport impacts of urban growth? A Delphi approach to examine the space–time suitability of transport indicators," *International Journal of Sustainable Transportation*, vol. 13, no. 8, pp. 597-613, 2019. https://doi.org/10.1080/15568318.2018.1491077

[18] People's Committee of Son La Province, "Decision No. 1567/QĐ-UBND dated August 3, 2022 on the approval of the land use planning to 2030," People's Committee of Son La Province, 2022.

[19] T. Hoang and N. M. N. Chu, *Data analysis in research using SPSS (Vols. 1 & 2)*. Ho Chi Minh: Hong Duc Publishing House, 2008.

[20] L. J. Cronbach, "Coefficient alpha and the internal structure of tests," *Psychometrika*, vol. 16, no. 3, pp. 297-334, 1951.

[21] D. T. Nguyen, *Scientific research methodology in business*. Ho Chi Minh: Financial Publishing House, 2014.[22] A. F. M. Alkarkhi and W. A. A. Alqaraghuli, "Factor analysis. In Easy statistics for food science with R," Elsevier, 2019, pp. 143–159.

[23] M. Igbaria, J. Iivari, and H. Maragahh, "Why do individuals use computer technology? A Finnish case study," *Information & management*, vol. 29, no. 5, pp. 227-238, 1995.

[24] J. Hair, W. C. Black, B. J. Babin, and R. E. Anderson, *Multivariate data analysis*. Pearson, 2009.

[25] T. L. Saaty, *The analytic hierarchy process*. New York: McGraw-Hill, 1980.

[26] J. Lu, G. Zhang, D. Ruan, and F. Wu, *Multi-objective group decision making: Method, software, and application with fuzzy techniques*. Singapore: World Scientific Publishing, 2007.

[27] T. L. Saaty, *Decision making with dependence and feedback: The analytic network process*. Pittsburgh: RWS Publications, 1996.