

# SWOT Analysis of Formation of Modern Irrigation Management Unit in DI Kromong (Kromong Irrigation Area), Kabupaten Mojokerto

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## ABSTRACT

Kromong Irrigation Area (Kromong Irrigation Area), is an irrigation area that already has readiness for the implementation of irrigation modernization (Sari, 2019). Hence, it is necessary to establish a Modern Irrigation Management Unit (UPIM), as an initial step to start the modernization of irrigation in the irrigation area. To find out the readiness for the establishment of UPIM, the data are needed for the existing irrigation management. The data were collected by firstly, interviewing irrigation officials in charge of the Kromong Irrigation Area. Secondly, distributing questionnaires to determine SWOT indicators to irrigation officials and the Association of Water Users Farmers Association (GHIPPA) in the Kromong Irrigation Area. Furthermore, the results of the SWOT indicators are weighted and rated to determine the Internal Strategic Factor Analysis Summary (IFAS) and External Strategic Factor Analysis Summary (EFAS) of each irrigation management agency. The study found that the readiness of mandatory functions in UPIM at Dinas PU PSDA Provinsi Jawa Timur had the highest value in the TOWS strategy quadrant graph (2.41 , 3.17), followed by UPT Pengairan Pugeran (1.89 , 2.24), and UPT PSDA Brantas Korwil Surabaya (0.78 , 1.86). All agencies have more strengths and opportunities than their weaknesses and threats. Therefore, DI Kromong is ready to establish an UPIM.

**Keywords :** infrastructure management, irrigation modernization, SWOT analysis, UPIM

## INTRODUCTION

Indonesia's Medium-Term Development Plan (RPJMN) 2015-2019 targets the achievement of food security as one of the priority agendas. In food security, irrigation systems play a vital role in maintaining the performance of lowland rice production.

At present, the total surface irrigation in Indonesia is 7.1 million ha, or 78% of the total national irrigation area of 9,136 million ha. Covering an area of 46% or around 3.3 million ha of irrigation infrastructure in damaged condition, (Audit of Irrigation Network Performance 2014, in PPPSI, 2018). The high rate of damage to the irrigation network has become an obstacle in achieving the RPJMN target if no further handling efforts are made. Whereas, infrastructure must be managed properly so that it can always be functional, economical, effective, efficient, and sustainable (Suprayitno & Soemitro, 2018).

To realize food security, the Ministry of Public Works and Housing is working to implement irrigation modernization. This is done to increase the level of irrigation services effectively, efficiently, and sustainably (Direktorat Irigasi dan Rawa, 2011)

In East Java Province, irrigation modernization has not yet been implemented. Whereas in terms of production capacity, rice fields in East Java Province produce the most amount compared to other provinces. A report from the Central Statistics Agency said that in 2018, total rice production in East Java was 10.6 million tons or 18.6% of all national production. This large production will certainly be even more enhanced if modernization is performed.

Nevertheless, research has been conducted on the readiness of irrigation modernization in the irrigation area in the authority of East Java Province in Mojokerto Regency (Sari, 2019). The results showed that there is one irrigation area that has a sufficient irrigation modernization readiness index for irrigation modernization (IKMI). The area is Daerah Irigasi (DI) Kromong.

As mandated by the RPJMN, every DI is required to have a modern irrigation management unit that functions to operate the irrigation network in a modern way. Therefore, it is necessary to examine the readiness to form a modern irrigation management unit in this irrigation area, as the first step of irrigation modernization.

## LITERATURE REVIEW

FAO defines irrigation modernization as a process of technical and managerial upgrading (as opposed to rehabilitation) of irrigation schemes combined with institutional reforms, intending to improve resource utilization (labor, water, economic, environmental) and water delivery service to farms (Renault, 1999). In Indonesia, experts have defined irrigation modernization under the legal context and conditions prevailing in Indonesia. According to the irrigation modernization must be interpreted as an effort to realize a participatory irrigation management system oriented to meeting the level of irrigation services effectively, efficiently, and sustainably to support food and water security, through increasing the reliability of water supply, infrastructure, irrigation management, institutions management, and human sources power (Arif, et al, 2014).

In achieving this modernization, it is necessary to form a modern irrigation management unit or Unit Pengelola Irigasi Modern. A study on UPIM was once conducted by the PSDA Research and Development Center (Balai Litbang PSDA). The resulting design consisted of UPIM minimal structure, UPIM intermediate structure, and UPIM advanced structure (Balai Litbang SDA, 2016). Each structure is adapted to the stages of the implementation of modern irrigation that has been conducted.

The minimum UPIM design model in a cross-province irrigation area is attached to certain positions in the current Balai Besar Wilayah Sungai (Major River Basin Organization) structure. The minimum UPIM design model in cross-regency irrigation areas, implementation authority, and responsibility remain with the central government. The management and budget of the Operation and Maintenance (OM) are handed over to the regional government through TPOP (Tugas Pembantuan Operasi dan Pemeliharaan). The TPOP is the delegation of authority of operation and maintenance activities from the Provincial Government to the Regency Government, with the operation and maintenance funds from the Province, but the management personnel funding comes from the Regency. The minimum UPIM design model in the irrigation area located at one regency is the same as the minimum UPIM design model across regencies.

The intermediate UPIM design model is a form of UPIM organization that can carry out some of its functions independently. It will be implemented only in the central authority irrigation areas. The Advanced UPIM design model is a form of UPIM organization that is considered to have the ability to perform all UPIM mandatory functions independently in which one DI is managed by one UPIM.

Wiryawan, et al (2017), after researching 5 irrigation areas in Indonesia, succeeded in formulating the organizational functions that must be present at UPIM. These functions are 1.)

information systems and operations and maintenance programs (OM); 2.) operation and maintenance control; 3.) irrigation security; 4.) Knowledge Management center and human capital; and 5.) water use planning and training. These five functions are used in this study to measure readiness in forming UPIM through the SWOT method.

SWOT analysis is one of the strategic plans used to measure strengths, weaknesses, opportunities, and threats that occur in projects, organizations, or business ventures (Quincy, et al, 2012).

In this case, strength is defined as an aspect of the organization that will produce large profits. Weakness is an aspect of the organization that results in losses. Opportunities are prospects that can cause organizational performance to improve. And threats are prospects that can cause problematic organizational performance. Strengths and weaknesses are the internal domain of an organization, while opportunities and threats are the external scopes of an organization.

Existing external and internal factors are then made into a matrix, namely the EFAS (External Strategic Factors Analysis Summary) matrix and IFAS (Internal Strategic Factors Analysis Summary). Based on the EFAS and IFAS matrices, the right strategy quadrant in TOWS (Threats, Opportunities, Weaknesses, Strengths) graph is determined for the implementation of an expected goal. This strategy quadrant is divided into 4 (Rangkuti, 2015), namely 1.) SO quadrants (Strengths-Opportunities), suggesting that agencies maximize their strength to take advantage of opportunities that exist; 2.) ST quadrants (Strengths-Threats), which is a strategy directed at using strengths to overcome threats; 3) WO quadrant (Weaknesses-Opportunities), is a strategy that minimizes weaknesses to take advantage of opportunities; and 4) WT (Weaknesses-Threats) quadrant, is a strategy that minimizes weaknesses and avoids threats.

## **RESEARCH METHOD**

This research uses primary data and secondary data. Primary data were obtained from interviews for the existing institutional condition. While the distribution of the SWOT questionnaire was used to obtain readiness data for the establishment of UPIM based on the five mandatory functions of UPIM. Secondary data were obtained from regulations related to irrigation management institutions, Irrigation Area OM Manual, relevant scientific publications, and previous studies that have been conducted.

This study uses a non-probability sampling technique which does not provide equal opportunity/opportunity for each element/member of the population to be selected as a sample. The sampling technique used was purposive sampling, the selection of samples with certain considerations (Sugiyono, 2009). This is because not all members of the population understand the existing irrigation problems. This technique is suitable because this research does not aim to make a generalization. The following is a list of population mappings, samples, and types of questionnaires used:

**Table 1.** Population, Sample, and Questionnaire Mapping

No.	Population	Sample	Numbers of Respondents	Questionnaire Type
1	Officer / staff at Dinas PU PSDA Provinsi Jawa Timur	Head of Irrigation Division, Head of Operations Section, Head of Maintenance Section	3 people	Likert scale questionnaire
2	Officer / Staff at UPT PSDA Brantas Korwil Surabaya	Operations Staff, Survey and Planning Staff, Maintenance Staff	3 people	Likert scale questionnaire
3	Officer / Staff at UPT Pengairan Pugeran	Head of UPT, Head of Administration, Maintenance Staff	3 people	Likert scale questionnaire
4	GP3A (GHIPPA/The Union of HIPPA)	GHIPPA (The Union of HIPPA) at DI. Kromong	13 people	Likert scale questionnaire

The questionnaire was divided into 2 stages. The first stage is for the determination of the SWOT indicators of each agency. Second, the weight and rating assessment questionnaire on the SWOT indicators that have been obtained.

In the first questionnaire to determine the SWOT indicators, the list of questions came from the breakdown of the five mandatory functions (Wiryawan, et al, 2017) contained in UPIM plus the aspects of funding. The questionnaire uses a Likert scale to measure the SWOT indicator, which consists of 6 rating scales (Rangkuti, 2015) of the current conditions in each function, namely 1) very less; 2) less; 3) enough; 4) rather good; 5) good; and 6) very good. Answers from respondents with a score of 1-2, will be classified as internal indicators: weaknesses, and external: threats. While answers with grades 3-6 are classified as internal: strength, and external: opportunity.

The answers from the first questionnaire were distributed again to the research respondents for the assessment of weights and ratings. Weights are used to determine the level of interest of each indicator, while rating is to determine the level of strength of each indicator at the agency. The weight and rating used to consist of 4 scales (Rangkuti, 2015). The weight breakdown consists of 1) very unimportant; 2) not important; 3) important, and 4) very important. While the rating consists of 1) very weak; 2) weak; 3) strong, and 4) very strong.

Due to the lack of competency of respondents, the assessment of the weight and rating of the SWOT indicator from GHIPPA was conducted by respondents from three management agencies. The weights and ratings are then used to construct the EFAS and IFAS matrices and determine the appropriate quadrant of the UPIM formation strategy.

## ANALYSIS RESEARCH

### Existing Institutional Conditions

Irrigation management in the Kromong Irrigation Area is managed by 3 local government institutions. These three institutions are first, Dinas PU PSDA Provinsi Jawa Timur (Public Works Department of Water Resources Management of East Java Province), as the main agency holding the authority of irrigation management, covering the formulation of policies, planning, guidance, supervision, control, implementation, monitoring, evaluation and reporting of irrigation activities. Second, UPT PSDA Brantas Korwil Surabaya (part of UPT PSDA Brantas), as the Technical Implementing Unit of Dinas PU PSDA Provinsi Jawa Timur. It has the task to plan and implement operations and maintenance in the field of irrigation management. Third, UPT Pengairan Pugeran, which is the technical implementing unit of the authority of Mojokerto Regency which has a task to perform TPOP from Dinas PU PSDA Provinsi Jawa Timur.

DI Kromong belongs to the UPT PSDA Brantas (which is located in Kediri City) which operates irrigation areas located in the Brantas River Basin. Because of the large working area

of UPT PSDA Brantas, the organization was divided by Dinas into three UPT Korwil, namely UPT Malang, UPT Kediri, and UPT Surabaya. DI Kromong is included in the working area of UPT Surabaya. This UPT is directly responsible to the Head of Dinas PU PSDA Provinsi Jawa Timur.

UPT PSDA Brantas Korwil Surabaya does not have an echelon IV structure, because the position of Section Head is in UPT Brantas in Kediri City. The number of employees working in UPT PSDA Brantas Korwil Surabaya office is 36 people. Of these, 29 were civil servants, while 7 were non-civil servants. Of these, 3 are operating staff, and 8 are maintenance staff. The average education of employees is a bachelor's degree.

UPT also has employees who work in the field, namely PPA (Irrigation Water Gate Officer), and pekarya (Workers for Maintenance). The total number of PPA is 34 people and pekarya is 23 people.

In DI Kromong, the number of PPA is 7 people and the Pekarya are 3 people. The number of pekarya/workers is insufficient to perform operations and maintenance in the field. According to regulation (Permen PUPR No. 12 / PRT / M 2015), pekarya should be 1 person per 2-3 km channel length. The total channel length in DI Kromong is 14.16 km. So ideally it takes 5 pekarya.

Since the merger of UPT PSDA DI Surabaya with UPT PSDA Brantas, there have been some changes in staffing. UPT PSDA Korwil Surabaya appoints a juru (a person who is in charge of irrigation operation on the field, from planting a plant, to supervising PPA's work of operating irrigation water gate, maintenance, and reporting) for the irrigation area which became its territory. This includes juru for DI Kromong. There is one juru for DI Kromong from UPT PSDA Brantas Korwil Surabaya, in addition to one juru from UPT Pengairan Pugeran.

Because the irrigation area of DI Kromong is located in one regency, namely Kabupaten Mojokerto, the TPOP system has been implemented to DPUPR Kabupaten Mojokerto (Department of Public Works and Spatial Planning Kabupaten Mojokerto). It has technical implementing unit named UPT Pengairan Pugeran.

UPT Pengairan Pugeran organization has a simple structure, consisting of the Head of UPT, the Head of the Administration Unit, the Functional Position Group, and the Staff. Besides managing the DI Kromong, UPT also manages all the Irrigation Area in Mojokerto Regency (47 DI) with a total area of 7632 Ha.

In addition to that two agencies, there is also an institution named the Water User Farmers Association (HIPPA), which also determines the planting plan at the start of the rainy season (MH-1/Musim Hujan-1). There are 7 HIPPA in DI Kromong that has joined the organization called GHIPPA (The Union of HIPPA) Tirto Kencono.

### **SWOT Analysis of Potential UPIM Formation**

#### **Dinas PU PSDA Provinsi Jawa Timur**

The results of processing the questionnaires showed that the strengths in Dinas PU PSDA Provinsi Jawa Timur were more than its weaknesses. The strengths of Dinas PU PSDA Provinsi Jawa Timur tend to be in the function of the information system and the OM program. Employees are happier if there is IT technology for the OM program and they on average understand and can operate the OM system. On the other hand, the weakness is in farmers who do not know about the irrigation OM information system. In addition, the funding factor is also a weakness because it tends to be difficult to propose additional funds in the irrigation sector. The following is a complete explanation in the IFAS score table:

**Table 2.** IFAS Score of Dinas PU PSDA Provinsi Jawa Timur

No.	List of Indicators	Score
	<b>STRENGTHS</b>	
<b>A</b>	<b>Information System Functions and OM Programs</b>	
1	Employees in the field of irrigation tend to be happier if IT technology is installed for irrigation OM	0.09
2	Officers understand and can operate the irrigation OM system	0.09
3	Officers who collect the data on water demand and availability are sufficient	0.08
4	Officers who analyze the needs and availability of water are sufficient	0.08
5	Officers who make water balance and water allocation are sufficient	0.08
6	The information system and OM program are partly computerized	0.09
7	Officers who can prepare budget plans related to irrigation management are sufficient	0.07
8	The leaders/staff know about the irrigation OM information system	0.07
9	HIPPA is willing to be involved in finding data on water needs and availability	0.06
10	HIPPA is willing to be involved in preparing the water balance and water allocation	0.06
11	HIPPA is willing to be involved in analyzing water demand and availability	0.06
12	HIPPA is willing to be involved in preparing budget plans related to irrigation management	0.06
13	HIPPA wants information systems and computerized OM programs	0.05
<b>B</b>	<b>OM Control Function</b>	
1	Standard Operating Procedures (SOP) in OM activities already exist	0.10
2	OM activities have been controlled/monitored according to SOP	0.10
3	There are vehicle facilities to supervise maintenance/check network conditions	0.10
4	There are enough personnel for maintenance inspections	0.07
5	HIPPA wants to be involved in supervising maintenance / checking the condition of irrigation networks	0.07
6	HIPPA wants to be involved in minor repairs at any time if there is damage to the irrigation network	0.06
<b>C</b>	<b>Irrigation Security Function</b>	
1	Irrigation security activities are conducted well by field officers	0.09
2	Have collaborated with external parties to secure irrigation water	0.09
3	Irrigation water security activities have been established	0.08
4	The main functions of water security are already stated in the organizational structure	0.07
5	HIPPA wants to be involved in irrigation security activities	0.07
<b>D</b>	<b>Knowledge Management and Human Capital</b>	
1	Employee performance is measured and evaluated	0.10
2	There is an employee career development program	0.10
3	Recruitment of employee specifications is done under the needs of the position	0.10
4	There is a reward and punishment system for employees	0.10
5	Irrigation network construction data are well documented	0.09
6	Irrigation management field data are well documented	0.09
7	There was training to increase employee competency at the agency	0.09
8	Farmers want to be always informed about the availability of irrigation water for their land	0.09
9	Farmers want increased knowledge about agricultural irrigation	0.09
10	HIPPA always reports the condition of water availability to the irrigation management agency (Dinas / UPTD)	0.07
<b>E</b>	<b>Water Use Planning and Training Function</b>	
1	There is training about irrigation from the office	0.09
2	There is a trainer of Water Use Planning and Training Function at the office	0.09
3	Dinas has subject matter about irrigation training	0.09

**Table 2.** Continued...

No.	List of Indicators	Score
4	HIPPA wants information about irrigation	0.07
5	HIPPA wants to be involved in counseling about irrigation	0.06
<b>F</b>	<b>Funding</b>	
1	HIPPA agrees if contributions are drawn for tertiary irrigation channel OM	0.07
2	HIPPA is willing if given the mandate to manage water user contribution	0.05
	<b>TOTAL SCORE OF STRENGTHS (S)</b>	<b>3.27</b>
	<b>WEAKNESSES</b>	
<b>A</b>	<b>Information System Functions and OM Programs</b>	
1	Farmers do not know about the irrigation OM information system	0.01
2	Farmers do not understand and are not able to operate the irrigation OM system	0.01
<b>B</b>	<b>OM Control Function</b>	
1	There is no mobile irrigation network maintenance yet	0.04
<b>C</b>	<b>Irrigation Security Function</b>	
	-	
<b>D</b>	<b>Knowledge Management and Human Capital</b>	
1	No information system is used as a tool to analyze water availability and use	0.02
<b>E</b>	<b>Water Use Planning and Training Function</b>	
	-	
<b>F</b>	<b>Funding</b>	
1	OM funds do not comply with AKNOP (real budgeting for operation and maintenance)	0.01
2	Proposed additional funds for the irrigation sector tend not to be easily realized	0.01
	<b>TOTAL SCORE WEAKNESSES (W)</b>	<b>0.10</b>

On external factors, Dinas PU PSDA Provinsi Jawa Timur has more opportunities than existing threats. The main opportunity is the availability of sufficient upstream water, and there is also the potential for additional water in addition to existing irrigation. This is the main requirement in the modernization of irrigation. While a significant threat is the presence of external factors that can damage irrigation buildings, as shown in the following table:

**Table 3.** EFAS Score of Dinas PSDA Provinsi Jawa Timur

No.	List of Indicators	Score
	<b>Opportunities</b>	
<b>A</b>	<b>Information System Functions and OM Programs</b>	
1	The availability of upstream water is sufficient	0.18
2	<i>The catchment area</i> upstream is not damaged	0.18
3	Good quality internet network	0.17
4	There is an internet network in the area of irrigated land	0.15
5	There are no obstacles to the provision of information systems and OM programs for irrigation	0.10
6	There are companies providing information systems and OM programs for irrigation near Dinas location	0.09
<b>B</b>	<b>OM Control Function</b>	
1	Irrigation area is not disaster-prone areas	0.09
2	There is a building material shop for irrigation in the vicinity of the irrigation area (for providing minor repairs at any time)	0.06
3	It is easy to get workers to do small repairs at any time	0.06
4	There is an irrigation building material store in the vicinity of the irrigation area (for providing minor repairs at any time)	0.05
<b>C</b>	<b>Irrigation Security Function</b>	
1	There is potential for additional irrigation water sources other than the existing ones	0.15

**Table 3.** Continued...

No.	List of Indicators	Score
2	There are external parties (other than Dinas and UPTD) who handle irrigation from water theft	0.14
3	Satpol PP (municipal police unit that is under local government control) can be involved in securing irrigation	0.10
<b>D</b>	<b>Knowledge Management and Human Capital Function</b>	
1	There are no external parties (outside Dinas / UPTD) that obstruct efforts to increase knowledge about irrigation management for Dinas / UPTD personnel	0.13
2	There are consultants (outside Dinas / UPTD) who can provide training on irrigation	0.08
<b>E</b>	<b>Water Use Planning and Training Function Function</b>	
1	There is information about water use knowledge that can be accessed through various sources (internet, books, magazines, etc.)	0.13
2	There are competent irrigation trainer officers from outside Dinas agency	0.13
3	Farmers tend to be willing to be given information about irrigation	0.10
4	There are no external parties who obstruct access to information about water use knowledge	0.10
<b>F</b>	<b>Funding</b>	
1	There are other OM funding sources aside from the APBD (APBN, IPDMIP)	0.18
2	There was training about water user contribution management at the HIPPA	0.13
3	HIPPA is considered capable of organizing contributions from the Water Users Farmers' Association	0.10
4	The training was conducted on the importance of water user contribution to the HIPPA	0.10
	<b>TOTAL SCORE OF OPPORTUNITIES (O)</b>	<b>2.72</b>
	<b>THREATS</b>	
<b>A</b>	<b>Information System and OM Programs Function</b>	
1	There are no external parties who offer the use of information systems and irrigation OM programs near irrigation locations	0.05
<b>B</b>	<b>OM Control Function</b>	
1	There are external factors that can damage the irrigation building	0.06
<b>C</b>	<b>Irrigation Security Function</b>	
1	Irrigation water theft has occurred, but not often	0.05
2	Some outsiders do actions that can reduce the availability of irrigation water	0.03
3	The availability of irrigation water is less reliable	0.02
<b>D</b>	<b>Knowledge Management and Human Capital</b>	
1	There is no information system provider company about water data around the agency	0.05
<b>E</b>	<b>Water Use Planning and Training Function</b>	
	-	
<b>F</b>	<b>Funding</b>	
1	Dana Desa (Budget for the village transferred from the central government) is not allocated to irrigation networks OM	0.06
	<b>TOTAL SCORE OF THREATS (T)</b>	<b>0.31</b>

UPT PSDA Brantas Korwil Surabaya

The results of the questionnaire distributed to respondents at UPT PSDA Brantas Korwil Surabaya showed that the strengths were greater than the weaknesses. Significant strengths include OM activities that have been controlled/monitored according to the SOP, and irrigation security has been activated. While an important weakness is the absence of an information system that can be used to analyze water availability and use. The complete SWOT indicators are in the IFAS table as follows:

**Table 4.** IFAS Score of UPT PSDA Brantas Korwil Surabaya

No.	List of Indicators	Score
	<b>STRENGTHS</b>	
<b>A</b>	<b>Information System and OM Programs Function</b>	
1	Officers who can prepare budget plans related to irrigation management are sufficient	0.06



**Table 4.** Continued...

No.	List of Indicators	Score
2	Officers understand and can operate the irrigation OM system	0.06
3	The leaders/staff know about the irrigation OM information system	0.06
4	Employees in the field of irrigation tend to be happier if IT technology is installed for irrigation OM	0.05
5	The information system and OM program are partly computerized	0.05
6	Officers who collect the data on water demand and availability are sufficient	0.05
7	Officers who analyze the needs and availability of water are sufficient	0.05
8	HIPPA is willing to be involved in finding data on water needs and availability	0.05
9	Officers who make water balance and water allocation are sufficient	0.04
10	HIPPA is willing to be involved in preparing the water balance and water allocation	0.04
11	HIPPA is willing to be involved in analyzing water demand and availability	0.04
12	HIPPA is willing to be involved in preparing budget plans related to irrigation management	0.02
13	HIPPA wants information systems and computerized OM programs	0.02
<b>B</b>	<b>OM Control Function</b>	
1	OM activities have been controlled/monitored according to SOP	0.06
2	There are vehicle facilities to oversee maintenance/check network conditions	0.06
3	Enough personnel for maintenance inspections	0.05
4	Standard Operating Procedures (SOP) in OM activities already exist	0.05
5	HIPPA wants to be involved in supervising maintenance / checking the condition of irrigation networks	0.05
6	HIPPA wants to be involved in minor repairs at any time if there is damage to the irrigation network	0.05
<b>C</b>	<b>Irrigation Security Function</b>	
1	Irrigation water security activities have been established	0.08
2	Irrigation security activities are conducted well by field officers	0.06
3	HIPPA wants to be involved in irrigation water security activities	0.06
4	The main functions of water security are already stated in the organizational structure	0.05
5	Have collaborated with external parties to secure irrigation water	0.05
<b>D</b>	<b>Knowledge Management and Human Capital</b>	
1	Employee performance is measured and evaluated	0.09
2	Irrigation management field data are well documented	0.07
3	Irrigation network construction data are well documented	0.07
4	There is a reward and punishment system for employees	0.07
5	There was training to increase employee competency at the agency	0.07
6	HIPPA always reports the condition of water availability to the irrigation management agency (Dinas / UPTD)	0.06
7	Recruitment of employee specifications is done under the needs of the position	0.05
8	There is an employee career development program	0.06
9	Farmers want to be always informed about the availability of irrigation water for their land	0.05
10	Farmers want increased knowledge about agricultural irrigation	0.05
<b>E</b>	<b>Water Use Planning and Training Function</b>	
1	There is a trainer of Water Use Planning and Training Function at UPTD	0.08
2	There is training about irrigation from UPTD	0.06
3	HIPPA wants information about irrigation	0.06
4	HIPPA wants to be involved in training about irrigation	0.06
5	UPTD has subject matter about irrigation training	0.05
<b>F</b>	<b>Funding</b>	
1	HIPPA is willing if given the mandate to manage water user contribution	0.03
2	HIPPA agrees if contributions are drawn for tertiary irrigation channel OM	0.02
	<b>TOTAL SCORE OF STRENGTHS (S)</b>	<b>2.22</b>

**Table 4.** Continued...

No.	List of Indicators	Score
<b>WEAKNESSES</b>		
<b>A</b>	<b>Information System Functions and OM Programs</b>	
1	Farmers do not know about the irrigation OM information system	0.08
2	Farmers do not understand and can operate the irrigation OM system	0.08
<b>B</b>	<b>OM Control Function</b>	
1	There is no mobile irrigation network maintenance yet	0.07
<b>C</b>	<b>Irrigation Security Function</b>	
	-	
<b>D</b>	<b>Knowledge Management and Human Capital</b>	
1	No information system is used as a tool to analyze water availability and use	0.06
<b>E</b>	<b>Water Use Planning and Training Function</b>	
	-	
<b>F</b>	<b>Funding</b>	
1	Proposed additional funds for the irrigation sector tend not to be easily realized	0.05
2	OM funds do not comply with AKNOP	0.03
	<b>TOTAL SCORE WEAKNESSES (W)</b>	<b>0.36</b>

For external factors, UPT PSDA Brantas Korwil Surabaya also has more opportunities (score 2.22) than threats (score 0.36). This indicates that the external environment supports the formation of UPIM functions. Great opportunities include good quality internet networks and catchment areas upstream that are not damaged. A significant threat is the presence of outsiders who commit acts that can reduce the availability of irrigation water. The full list is in the table below:

**Table 5.** EFAS Score of UPT PSDA Brantas Korwil Surabaya

No.	List of Indicators	Score
<b>OPPORTUNITIES</b>		
<b>A</b>	<b>Information System Functions and OM Programs</b>	
1	Good quality internet network	0.10
2	The availability of upstream water is sufficient	0.10
3	There are no obstacles to the provision of information systems and OM programs for irrigation	0.08
4	<i>The catchment area</i> at upstream is not damaged	0.08
5	There is an internet network in the area of irrigated land	0.07
<b>B</b>	<b>OM Control Function</b>	
1	Irrigation area is not disaster prone areas	0.12
2	There is an irrigation building material store in the vicinity of the irrigation area (for providing minor repairs at any time)	0.10
3	There is a building material shop for irrigation in the vicinity of the irrigation area (for providing minor repairs at any time)	0.10
4	It is easy to get workers to do small repairs at any time	0.08
<b>C</b>	<b>Irrigation Security Function</b>	
1	There is potential for additional irrigation water sources other than the existing ones	0.11
<b>D</b>	<b>Knowledge Management and Human Capital Function</b>	
1	There are consultants (outside Dinas / UPTD) who can provide training on irrigation	0.09
2	There are no external parties (outside Dinas / UPTD) that obstruct efforts to increase knowledge about irrigation management for Dinas / UPTD personnel	0.08
<b>E</b>	<b>Water Use Planning and Training Function</b>	
1	There are competent irrigation trainer officers from outside UPTD agency	0.08
2	Farmers tend to be willing to be given information about irrigation	0.06
3	There is information about water use knowledge that can be accessed through various	0.05

**Table 5.** Continued...

No.	List of Indicators	Score
	sources (internet, books, magazines, etc.)	
4	There are no external parties who obstruct access to information about water use knowledge	0.03
<b>F</b>	<b>Funding</b>	
1	There are other OM funding sources aside from the APBD (APBN, IPDMIP)	0.12
2	HIPPA is considered capable of organizing contributions from the Water Users Farmers' Association	0.10
3	There was a training on water user contribution management at the HIPPA	0.08
4	The training was conducted on the importance of water user contributions to the HIPPA	0.06
	<b>TOTAL SCORE OF OPPORTUNITIES (O)</b>	<b>1.66</b>
	<b>THREATS</b>	
<b>A</b>	<b>Information System Functions and OM Programs</b>	
1	There are no external parties who offer the use of information systems and irrigation OM programs near irrigation locations	0.11
2	There is no company providing information systems and OM programs for irrigation near UPTD location	0.08
<b>B</b>	<b>OM Control Function</b>	
1	There are external factors that can damage the irrigation building	0.07
<b>C</b>	<b>Irrigation Security Function</b>	
1	Some outsiders do actions that can reduce the availability of irrigation water	0.09
2	The availability of irrigation water is less reliable	0.07
3	Irrigation water theft has occurred, but not often	0.04
4	Satpol PP (municipal police unit that is under local government control) is difficult to be involved in securing irrigation	0.04
5	There are no external parties (other than Dinas and UPTD) who handle irrigation water theft	0.09
<b>D</b>	<b>Knowledge Management and Human Capital Function</b>	
1	There is no information system provider company about water data around the agency	0.10
2	There is no company providing an information system about water data around the irrigation location	0.10
<b>E</b>	<b>Water Use Planning and Training Function</b>	
	-	
<b>F</b>	<b>Funding</b>	
1	Dana Desa is not allocated to irrigation networks OM	0.10
	<b>TOTAL SCORE OF THREATS (T)</b>	<b>0.88</b>

#### UPT Pengairan Pugeran

Similar to the two previous agencies, at UPT Pengairan Pugeran, the strength score was greater than the weakness score (strength 2.61, weakness 0.37). The main strength is the number of officers who collect the data on water demand and availability is sufficient. While a significant weakness is that the information system and OM program are partly not yet computerized. These can be seen in the following table:

**Table 6.** IFAS Score of UPT Pengairan Pugeran

No.	List of Indicators	Score
	<b>STRENGTHS</b>	
<b>A</b>	<b>Information System Functions and OM Programs</b>	
1	Officers who collect water demand and availability data are sufficient	0.08
2	Employees in the field of irrigation tend to be happier if IT technology is installed for irrigation OM	0.08
3	The officer who analyzes the needs and availability of water is sufficient	0.10
4	Officers understand and can operate the irrigation OM system	0.05
5	Officers who can prepare budget plans related to irrigation management are sufficient	0.08

**Table 6.** Continued...

No.	List of Indicators	Score
6	HIPPA is willing to be involved in finding data on water needs and availability	0.07
7	HIPPA is willing to be involved in preparing the water balance and water allocation	0.08
8	HIPPA is willing to be involved in analyzing water demand and availability data	0.07
9	Officers who make water balance and water allocation are sufficient	0.08
10	The leaders/staff know about the irrigation OM information system	0.06
11	HIPPA wants information systems and computerized OM programs	0.05
12	HIPPA is willing to be involved in preparing budget plans related to irrigation management	0.04
<b>B</b>	<b>OM Control Function</b>	0.00
1	OM activities have been controlled/monitored according to SOP	0.05
2	Standard Operating Procedures (SOP) in OM activities already exist	0.05
3	Enough personnel for maintenance inspections	0.07
4	HIPPA wants to be involved in minor repairs at any time if there is damage to the irrigation network	0.05
5	HIPPA wants to be involved in supervising maintenance / checking the condition of irrigation networks	0.05
<b>C</b>	<b>Irrigation Security Function</b>	0.00
1	The main functions of security are already stated in the organizational structure	0.05
2	Irrigation security activities are conducted well by field officers	0.06
3	Irrigation water security activities have been established	0.06
4	Have collaborated with external parties to secure irrigation water	0.07
5	HIPPA wants to be involved in irrigation water security activities	0.07
<b>D</b>	<b>Knowledge Management and Human Capital Function</b>	0.00
1	There was training to increase employee competency at the agency	0.08
2	Recruitment of employee specifications is done under the needs of the position	0.06
4	Farmers want to be always informed about the availability of irrigation water for their land	0.08
5	Farmers want increased knowledge about agricultural irrigation	0.08
6	HIPPA always reports the condition of water availability to the irrigation management agency (Dinas / UPTD)	0.07
7	Employee performance is measured and evaluated	0.06
8	There is an employee career development program	0.07
8	There is a reward and punishment system for employees	0.07
9	There was training to increase employee competency at the agency	0.06
10	Irrigation network construction data are well documented	0.07
<b>E</b>	<b>Water Use Planning and Training Function</b>	0.00
1	There is training about irrigation from UPTD	0.08
2	UPTD has subject matter about irrigation training	0.08
3	There is a trainer of Water Use Planning and Training Function at UPTD	0.08
4	HIPPA wants information about irrigation	0.08
5	HIPPA wants to be involved in training about irrigation	0.07
<b>F</b>	<b>Funding</b>	
1	HIPPA is willing if given the mandate to manage water user contributions	0.07
2	HIPPA agrees if contributions are drawn for tertiary irrigation channel OM	0.05
	<b>TOTAL SCORE OF STRENGTHS (S)</b>	<b>2.61</b>
	<b>WEAKNESSES</b>	
<b>A</b>	<b>Information System Functions and OM Programs</b>	
1	Farmers do not know about the irrigation OM information system	0.04
2	Farmers do not understand and are not able to operate the irrigation OM system	0.04
3	Some information systems and OM programs have not yet been computerized	0.05
<b>B</b>	<b>OM Control Function</b>	
1	Lack of vehicle facilities to supervise maintenance/check network conditions	0.04
2	There is no mobile irrigation network maintenance yet	0.05
<b>C</b>	<b>Irrigation Security Function</b>	
<b>D</b>	<b>Knowledge Management and Human Capital Function</b>	
1	Irrigation management field data is not well documented	0.04
2	No information system is used as a tool to analyze water availability and use	0.04

**Table 6.** Continued...

No.	List of Indicators	Score
<b>E</b>	<b>Water Use Planning and Training Function</b>	
<b>F</b>	<b>Funding</b>	
1	OM funds do not comply with AKNOP	0.04
2	Proposed additional funds for the irrigation sector tend not to be easily realized	0.04
	<b>TOTAL SCORE WEAKNESSES (W)</b>	<b>0.37</b>

For external factors, UPT Pengairan Pugeran also has more opportunities than the existing threats. Important opportunities here include the availability of internet networks on irrigated land and also the easy availability of materials for minor repairs of irrigation at any time if there is damage. Existing threats tend to be the same as UPT PSDA Brantas, i.e. the existence of parties who take irrigation water illegally and the theft of irrigation water. More can be seen in the following table:

**Table 7.** EFAS Score of UPT Pengairan Pugeran

No.	List of Indicators	Score
	<b>OPPORTUNITIES</b>	
<b>A</b>	<b>Information System Functions and OM Programs</b>	
1	The availability of upstream water is sufficient	0.14
2	Good quality internet network	0.13
3	<i>The catchment area</i> upstream is not damaged	0.09
4	There are no obstacles to the provision of information systems and OM programs for irrigation	0.08
5	There is an internet network in the area of irrigated land	0.10
<b>B</b>	<b>OM Control Function</b>	
1	Irrigation areas are not disaster-prone areas	0.10
2	There is a building material shop for irrigation in the vicinity of the irrigation area (for providing minor repairs at any time)	0.12
3	It is easy to get workers to do small repairs at any time	0.13
4	There is an irrigation building material store around the location of the irrigation area	0.09
<b>C</b>	<b>Irrigation Security Function</b>	
1	Satpol PP (municipal police unit that is under local government control) (municipal police unit that is under local government control) can be involved in securing irrigation	0.13
2	There are external parties (other than Dinas and UPTD) who handle irrigation water theft	0.13
3	Availability of irrigation water is reliable	0.13
4	There is potential for additional irrigation water sources other than the existing ones	0.14
<b>D</b>	<b>Knowledge Management and Human Capital Function</b>	
1	There are no external parties (outside Dinas / UPTD) that obstruct efforts to increase knowledge about irrigation management for Dinas / UPTD personnel	0.08
2	There are consultants (outside Dinas / UPTD) who can provide training on irrigation	0.13
3	There are companies providing information systems about water data around the agency	0.06
<b>E</b>	<b>Water Use Planning and Training Function</b>	
1	Farmers tend to be willing to be given information about irrigation	0.13
2	There are competent trainers officers from outside UPTD agency	0.10
3	There are no external parties who obstruct access to information about water use knowledge	0.13
4	There is information about water use knowledge that can be accessed through various sources (internet, books, magazines, etc.)	0.13
<b>F</b>	<b>Funding</b>	
1	HIPPA is considered capable of organizing contributions from the Water Users Farmers' Association	0.10
	<b>TOTAL SCORE OF OPPORTUNITIES (O)</b>	<b>2.39</b>
	<b>THREATS</b>	
<b>A</b>	<b>Information System and OM Programs Function</b>	
1	There is no company providing information systems and OM programs for irrigation near UPTD location	0.06

**Table 7.** Continued...

2	There are no external parties who offer the use of information systems and irrigation OM programs near irrigation locations	0.06
<b>B</b>	<b>OM Control Function</b>	
1	There are external factors that can damage the irrigation building	0.10
<b>C</b>	<b>Irrigation Security Function</b>	
1	Irrigation water theft has occurred, but not often	0.06
2	Some outsiders do actions that can reduce the availability of irrigation water	0.07
<b>D</b>	<b>Knowledge Management and Human Capital Function</b>	
	-	
<b>E</b>	<b>Water Use Planning and Training Function</b>	
	-	
<b>F</b>	<b>Funding</b>	
1	Dana Desa is not allocated to irrigation networks OM	0.08
2	There are not enough sources of OM funds aside from the APBD	0.06
	<b>TOTAL SCORE OF THREATS (T)</b>	<b>0.50</b>

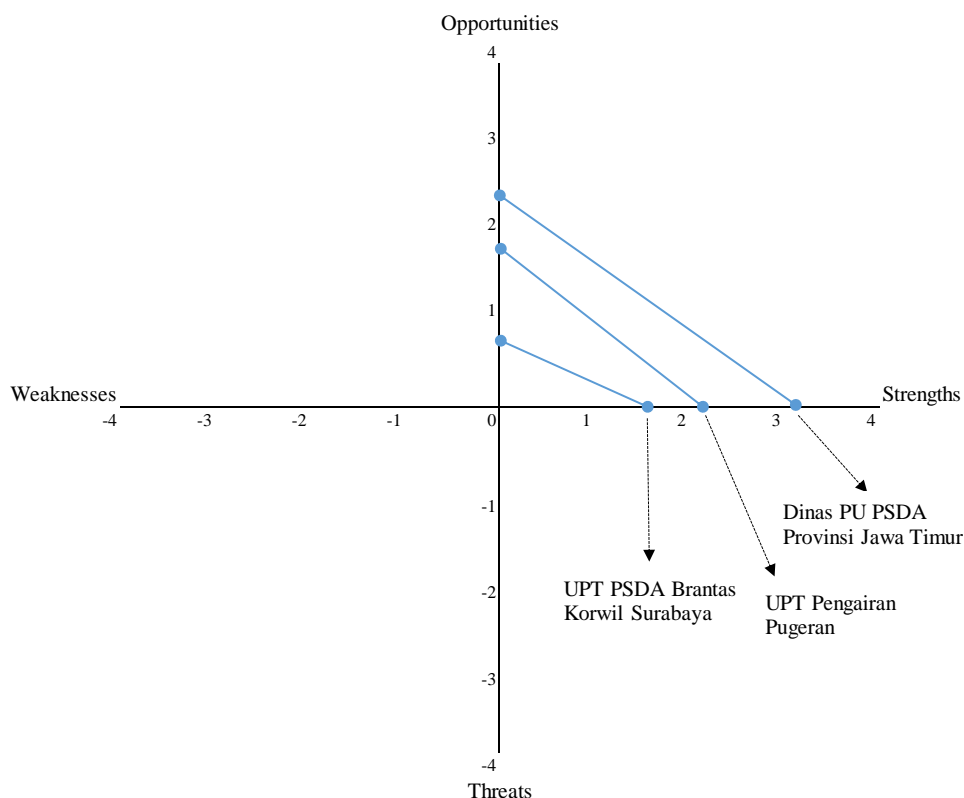
### Determination of the TOWS Quadrant UPIM Formation Strategy

After IFAS and EFAS have been formulated successfully, the strategy quadrant determination is done through the TOWS Graph. This is done by reducing the strengths score with weaknesses score in IFAS, and the opportunities score with threats score in EFAS to obtain the x and y coordinate points on the TOWS cartesian graph. The calculation of the strategy quadrant of each agency is displayed as follows.

**Table 8.** Strategy Quadrant of Irrigation Management Agencies in DI Kromong

IFAS		EFAS	
Category	Score	Category	Score
<b>DINAS PU PSDA PROVINSI JAWA TIMUR</b>			
Strength (S)	3.27	Opportunities (O)	2.72
Weakness (W)	0.1	Threat (T)	0.31
Total (S-W) X coordinate	3.17	Total (O-T) Y Coordinate	2.41
<b>UPT PSDA BRANTAS KORWIL SURABAYA</b>			
Strength (S)	2.22	Opportunities (O)	1.66
Weakness (W)	0.36	Threat (T)	0.88
Total (S-W) X coordinate	1.86	Total (O-T) Y Coordinate	0.78
<b>UPT PENGAIRAN PUGERAN</b>			
Strength (S)	2.61	Opportunities (O)	2.39
Weakness (W)	0.37	Threat (T)	0.5
Total (S-W) X coordinate	2.24	Total (O-T) Y Coordinate	1.89

The results of the x and y coordinates are illustrated in the TOWS graph as follows



**Picture 1.** Graph TOWS of 3 Irrigation Management Agencies in DI Kromong

In the graph above, it is illustrated that the three coordinates x, y of each agency are in quadrant I (positive x and y). This indicates that each agency must implement an SO (Strength-Opportunity) strategy in the formation of UPIM, which is maximizing the strengths in taking advantage of existing opportunities.

## CONCLUSION

From the results of the study, it can be concluded that three irrigation management agencies in DI Kromong are ready in forming UPIM. The highest value in the readiness is Dinas PU PSDA Provinsi Jawa Timur, followed by UPT Pengairan Pugeran Mojokerto Regency, and UPT PSDA Brantas Korwil Surabaya.

The establishment of UPIM in DI Kromong can then be determined based on consideration of regulations and the level of readiness of the existing irrigation management agency. The formation strategy in each agency must be directed at efforts to maximize strength and take advantage of existing opportunities. Further research is needed on establishing an appropriate UPIM organizational design and detailed strategies that can be implemented by each agency.

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