



Collaboration of Stakeholders as a Model for the Protection and Sustainable Management of Peatland Ecosystems

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<http://dx.doi.org/10.47814/ijssrr.v6i2.980>

Abstract

The protection and management of empowerment-based peatland ecosystems prioritizes the principles of education, participation, contribution and local wisdom. The purpose of this study is to understand the importance of collaborative multistakeholders roles in the process of achieving the output of peatland ecosystem sustainability projects. The collaborative role of stakeholders is a joint commitment to prevent various disasters such as droughts, loss of carbon stocks, and loss of biodiversity habitats. Building collaboration from the role of multistakeholders in the process of facilitation and empowerment-based assistance is an important factor in achieving the success of the SMPEI project in Tapak/Village. The TK-PPEG institutions as a forum for community participation and empowerment are strategic and appropriate solutions to implement the agreed programs as stated in the community work plan document (RKM); In addition, the collaboration of the multistakeholders, is important as a process of transferring community knowledge and skills in this project. The role of the collaboration among multi-stakeholders is a strategic model and a leading alternative to sustainable efforts in protecting and managing peatland ecosystems.

Keywords: *Collaboration; Multi-Stakeholders; Peatland Ecosystems*

I. Introduction

The protection and management of peatland ecosystems are part of the characteristics of managing peatland ecosystem that must be observed in a holistic approach. This corresponds to the concept from Hackman and Oldham (2005), stating that work characteristics are the work structures affecting the behavior and attitudes of workers towards working conditions.

From the perspective of the work characteristics of Hackman and Odham, there are 3 (three) important dimensions for the protection and management of peatland ecosystems, namely: 1) Expertise; 2) Job identity; and 3) Employment benefits. This means that parties or stakeholders who collaborate in the protection and management of sustainable peatland ecosystems are required to know, understand and master the characteristics of peatland ecosystems in addition to the specific meaning of protection and management. The definition and understanding of operations become important as part of the corridor of activities as well as the scope of actions.

The definition of the operations of Environmental Protection and Management is a systematic and integrated effort to preserve the function of the environment and prevent pollution and/or damage to the environment. The activities in the operations include planning, utilization, control, maintenance, supervision, and enforcement. (Government Regulation PP. No. 22 of 2021 concerning the Implementation, Protection and Management of the Environment). In this case the characteristics of protection and management are reflected in the process of planning, utilization, control, maintenance, supervision and prevention.

The characteristics of peatland ecosystems include: carbon sources stored below the soil surface, the ability to maintain hydrological and biogeochemical functions, the function to protect biodiversity and production of forest products, the ability to store and maintain large amounts of water, flood mitigation, and the ability to maintain availability of clean water. Therefore, burning peatlands is one of the distressing and frightening disaster. The critical situation is not only on the function of the soil and peatland itself but all ecosystems and biodiversity. With the occurrence of fires, natural peatland landscape decrease, natural resources disappear, and even slowly lose their beauty value. For this reason, there is no other way except to prevent fires on peatlands.

Peatland ecosystems are the most significant global carbon storage sites formed over tens of thousands of years. Apart from being a store of carbon below the soil surface, peatland also functions as a carbon pool so that it does not release it into the atmosphere. If peatlands are burned, carbon will be released into the atmosphere, and it even can become one of the causes of the greenhouse gas effect; contributing to global climate change and public health problems.

Experts agree that one of the important roles of carbon in peat is to prevent emissions so that the earth's temperature does not rise to 2 degrees Celsius. To prevent this temperature rise, humans on earth should not release emissions of more than 600 billion tons of carbon dioxide until 2050. This means that when Indonesia's carbon-rich peatlands are burned, the carbon that is released into the atmosphere is equal to one-third of the existing carbon reserves. In this case, the biggest impact on peat is drainage and fire which is usually accompanied by forest conversion. Drying causes the groundwater level to drop and this unwatered part will decompose so that carbon will be released into the air. This means that peat and peat burning will have an impact on peat destruction and peat shrinking or decreasing (to become subsidence) so that the land will lose its productivity and the multi-functional peatland will no longer be useful.

Preventing fires and sustainably managing Indonesia's peat ecosystems require the collaboration of all stakeholders. All collaborators must have the capacity to protect and manage peatland ecosystems. The motivation for this work is that the productivity of the peatlands must be strengthened and increased. Peatland must be good and proper protection and management. Avoid drying the peatland and prevent fires. The most special feature of peatland is the richness of its natural resources that needs to be preserved and empower it to remain the source of life and livelihood of the ecosystem including the humans living around it.

Likewise, the function of the opened peatland in the cultivation area should be maintained and empowered to enhance its productivity by applying the local environmental wisdom. Furthermore, for peatland ecosystems that are managed in protected functional areas, the management approach is conservation and restoration so that the ecosystem continues to function naturally.

II. Methodology

The study on the collaborative role of stakeholders in managing a sustainable peatland ecosystem has used the public opinion and action model (Public Opinion and Action Research / POAR). The methodology of this study uses descriptive qualitative approach by relying on the results of the literature review, with the aim of observing existing references, both theoretical foundations, findings or studies, as a relevant basis for the object of study.

The data processing in this study applied the descriptive analysis method. The descriptive analysis aims to transform a set of raw data into a more understandable form that takes the form of more concise information (Istijanto, 2009). Descriptive analysis in this study was carried out on the results of the respondent data based on their profile and the filled-in questionnaires. This method is used to describe the collected data with no intention to make conclusions that apply to the public or generalizations (Sugiyono, 2014).

The data collection procedure with the POAR model focuses on observation techniques, interviews, questionnaire dissemination, data analysis and interpretation and documentation.

Questionnaires on the POAR method include: 1) The role and function of peatlands; 2) Peatland utilization and management; 3) The status of peatland fires; 4) Assistance and protection of peatlands; 5) Peatland management models; Construction of canal blocking and plots; 6) TK-PPEG institutions and human resources improvement; 7) The concept of SMPEI; 8) Partnerships; and 9) Recommendations.

The study population is a generalized area consisting of objects and subjects (Hadi, 1986, Nawawi, 1995, and Sugiyono, 2008). The population in this POAR activity is the stakeholders managing the Sustainable Management of Peatland Ecosystems in Indonesia (SMPEI) program at the Central level (Ministry of Environment and Forestry, MoEF), Provincial level (Environment and Forestry Agency), District level (Environmental Service), and Village Government, as well as the Peatland Ecosystem Protection and Management Work Team (TK-PPEG) in 14 villages. These institutions are spread across 3 regencies (Pelalawan, Indragiri Hulu, and Indragiri Hilir) Riau Province. The number of administrators from 14 TK-PPEG assisted by the SMPEI program is 280 people.

SMPEI is one of the MoEF programs in Riau Province which has a mission to manage sustainable peatland ecosystems with a focus on fire prevention and community empowerment through stakeholder collaboration, including the active role of the Peatland Ecosystem Control and Management Work Team (TK-PPEG).

The respondents as a sample were 152 people (Krejcie & Morgan, 1970) and were representatives of the population (Creswell, 2010). They are representatives of the population (Harbani Pasolong, 2012). The respondents serve as a source for data and information that reflect the entire population (Nawawi, 1995, and Pasolong, 2012).

III. Literature Review

Indonesia has 865 Peat Hydrological Units (KHG) with a total area of approximately 24,667,804 hectares which are evenly distributed on the island of Sumatra with 207 KHG covering approximately 9,604,529 hectares, Kalimantan with 190 KHG covering approximately 8,404,818 hectares, Sulawesi with 3 KHG covering approximately 63,290 hectares, and Papua with 465 KHG covering approximately 6,595,167 hectares. (Directorate General. PPKL-KLHK, 2017 and Decree of the Minister of Environment and Forestry of the Republic of Indonesia No. SK.129/MENLHK/SETJEN/ PKL.0/2/2017 on the Determination of the National Peat Hydrological Unit Map).

The distribution of peatland is located on the island of Sumatra covering an area of 9,604,529 ha., spread across 10 provinces (Aceh, Bangka-Belitung, Bengkulu, Jambi, Riau Islands, Lampung, Riau, West Sumatra, South Sumatra, and North Sumatra). On the island of Kalimantan covering an area of

8,404,818 ha, which is spread across 5 provinces (West Kalimantan, South Kalimantan, Central Kalimantan, East Kalimantan, and North Kalimantan). On Sulawesi Island covering an area of 63,290 Ha., which is spread across 2 provinces (West Sulawesi and Central Sulawesi). On the island of Papua covering an area of 6,595,167 ha., which is spread across 2 provinces (Papua and West Papua).

One strategy for the protection and management of sustainable peatland ecosystems is the empowerment approach, which is a development concept framework that summarizes social values and reflects a new paradigm in development that is people centered participatory, empowering and sustainable (Chambers, 1995).

The concept of empowerment-based programs provides great opportunities for communities around peatlands and has even made peatlands a source of life and livelihood. To actively participate in gender-based requirements with local wisdom. The cycle starts from the planning stage, planning, utilization, maintenance and development of the program.

The results of the International Fund for Agriculture Development (IFAD) study confirm that the support from production produced by the lower strata of society contributes to greater growth compared to the same investment in the larger-scale sector of exports. (Margayaningsih, 2016). Brown emphasized that a plant can be produced with a smaller income and also with a small foreign exchange. Furthermore, the concept of community empowerment includes 3 aspects: 1) enabling; 2) empowering; and 3) protecting (Brown, 1995).

Enabling means creating an atmosphere that allows the community to develop their potential. Empowerment is a model and strategy of building and developing strengths by encouraging, motivating and raising awareness of the potential of the community.

Empowering means strengthening the potential and resources of the community through concrete steps that concern the provision of various inputs and opening up various opportunities that will empower the community. The most important efforts in this empowerment are to improve the level of knowledge, skills, and health as well as improve the access to sources of economic progress including the construction of basic facilities and infrastructure; which can be accessed by the layers of society that needs the most assistance.

Protecting means protecting and defending the interests of the vulnerable communities most in need. Participation in the decision-making process is an important moment that must be created in each stage of activity, which provides the initial foundation of the strength of the vulnerable people, both socially, economically and politically for the purpose of being able to bargain their position (Friedmann, 1994).

Development strategies that rely on community empowerment are known as a process of transformation in the social, economic, cultural and political relations of society, so that the structural changes take place naturally. Empowering concepts start with who is the most problematic and who needs solutions the most. Furthermore, the optimization of participation with a partnership-based group approach model along with comprehensive and rational measures are key features in the empowerment approach.

IV. Results and Discussion

SMPEI in Riau Province is motivated by many factors, including the active fires or burning that causes the spreading of smoke which adversely affects the immediate environment, and even neighboring countries of Indonesia. In the last 5 years, the area of peatland fires in Riau Province is known to be detailed as follows: In 2015 covering an area of 107,039.27 Ha., in 2016 covering an area of 74,128.25 Ha., in 2017 covering an area of 6,624.79 Ha., in 2018 covering an area of 25,390.21 Ha., in 2019

covering an area of 54,358.74 Ha., and in 2020 covering an area of 13,617.60 Ha. (PKG PPKL KLHK, 2020).

One of the breakthroughs in the SMPEI project with the person in charge of the Directorate of Peat Degradation Control (PKG) Directorate General of Environmental Pollution and Degradation Control (PPKL) of the Ministry of Environment and Forestry (KLHK) is the design of the multi-stakeholder role collaboration. This collaborative and empowerment oriented process begins with :1) Conducting cooperation with the Provincial and District Environmental Offices; 2) Establish community facilitators; 3) Establish a village community institution known as the TK-PPEG; 4) Conducting Problem Identification and Situation Analysis (IMAS); 5) Develop a Community Work Plan (RKM); 6) Implement the RKM; and 7) Improve the function of empowerment-based collaboration and partnerships, both vertically and horizontally, and internal and external partnerships.

The choice of a comprehensive and rational community empowerment approach is a development model that favors the peatland care communities that need it most. Optimization of community participation must be realized in every stage of activity. Collaboration of stakeholders' active roles is a basic commitment that is required to be owned by other program management elements outside the community. The SMPEI program has provided space for all stakeholders to actively participate in the protection and management of sustainable peatland ecosystems and collaborate in every stage of activities.

In the planning stage related to the procurement of community facilitators, the community representatives are selected based on a standard criteria of facilitators. The administrative selection process and competencies (knowledge, skills and personality), are carried out based on openness and fair opportunities for anyone to compete in a just manner. Anyone and from any group has the same opportunity to become a community facilitator. Those who pass the selection are designated as community facilitators and the one with excellent capacity can be selected as a facilitator coordinator at the district level.

The planning process by combining the principles of empowerment and the concept of human resource planning has been responded positively by all parties, especially by facilitator candidates.

In its implementation, Community Facilitators partner with the District Environment Office, the District Government, Village / Kelurahan Government, the Village Community Institution Administrators such as the Rapid Reaction Team (TRC), Fire Care Community (MPA), Non-Governmental Organizations, and TK-PPEG. In practice, all parties collaborate in units of principles, namely protecting peatlands, empowering peatlands, managing sustainable peatland ecosystems, and preventing fires.

At the stage of establishing the TK-PPEG in representing the community, they start with disseminating programs and searching for volunteers that care for the peatland environment. All volunteers identified by community facilitators are invited to counsel to form the TK-PPEG which is then formalized under a Decree of the Village Head / Lurah. The process of forming the TK-PPEG was viewed positively by respondents because it was open to democratic principles.

For the SMPEI Program, the establishment of the TK-PPEG is an agenda for capacity building and empowerment of Human Resources (HR) in terms of knowledge, skills and attitudes. The TK-PPEG is aimed to serve as a forum for participation in sustainable peatland ecosystem management. (POAR, 2020, QG1 - QG5).

In the planning stage, the TK-PPEG develops an RKM plan that starts with Problem Identification and Situation Analysis through a Participatory Rural Appraisal (PRA) approach. The community and the management and members of the TK-PPEG are involved as the source of information and concurrently are the actors of these activities at this planning stage.

The results of identifying the problems through the survey have revealed that most of the farmers choose to use the peatland for palm oil plantation. These people don't have much farming skills other than palm oil cultivation. Most people do not understand the advantages of peatland that contains carbon and can store clean water. They make ditches or canals but only to dispose the water so that it would be easy to grow palm oil trees. In addition, the community knows no other way to clear the land except by burning the land, even if they themselves understand the risks of arson.

Based on the results of the POAR, and followed by the exchange of experiences with community facilitators through community consultation, all the TK-PPEGs can finally submit their RKM plan according to their priority needs.

A total of 4 TK-PPEGs in Pelalawan Regency have been developed their priority RKM plan for program options: 1) Construction of 102 units of canal partitions; 2) Cultivation of pineapple, lime, betel nut, sago, jelutung, covering an area of 29 hectares; and 3) Cultivate carp fish and catfish in floating crates.

A total of 6 TK-PPEGs in Indragiri Hilir Regency have developed their priority RKM plan for program options: 1) Construction of 127 canal partitions; and 2) Cultivation of coconut trees, betel nut, banana, jengkol, motoa, cempedak, pineapple, ginger, kencur, turmeric, sweet potato, chili, 30.5 hectares.

A total of 4 TK-PPEGs in Indragiri Hulu Regency have developed their priority RKM plans for program options: 1) Construction of 84 canal partitions; and 2) Cultivation of bananas, jelutung, chilies, ginger, kaempferia galanga, (aromatic ginger, kencur), betel nut, corn, pineapple, mango, motoa, mangosteen, rambutan and durian covering an area of 24 hectares; and 3) Cultivate catfish with floating crates.

Assuming that the canal bulkhead can irrigate 30 Ha., then as many as 313 units of canal bulkheads have contributed to irrigating peatland covering an area of 9,390 Ha. peatland.

Along the way, the TK-PPEGs, with assistance from community facilitators, have partnered with the Village Government, the Rapid Reaction Team (TRC), the Fire Care Community (MPA), and a number of other Village Community Institutions (LKD) that are oriented towards the environment and disaster mitigation. (POAR, 2020, QI1 - QI3).

Through the SMPEI program, the TK-PPEG and the community recognize the role and function of peatlands as environmental assets, as a source of life, as economic assets, as environmental assets, and as assets for prosperity. (POAR, 2020, QA1 - QA6).

Peatland is not only suitable for palm oil plantation but also for various crop commodities as proposed in the RKM. (POAR, 2020, QB11) and even for fisheries such as carp, catfish and cork fish. (POAR, 2020, QB12) as recommended in the RKM plan of the TK-PPEG.

Prior to the SMPEI program, the leading agricultural commodity on peatlands was palm oil, since the community had limited knowledge and skills to choose other commodities besides palm oil. They are aware that they have not been able to manage the peatlands properly and realize that farming on peatlands is more difficult than on mineral lands. (POAR, 2020, QB1 - QB3).

In clearing the land, the main choice until now is still by burning the land even if they can control and is maintain the fire. They admit that the option of burning the bushes is very risky in letting the fire to get out of control besides the imposed criminal sanctions. All the TK-PPEGs and the communities are in dire need of a model or a more effective and environmentally friendly formula for clearing bushes and the land. (POAR, 2020, QC1 - QC10).

The model of mentoring Community Facilitators to TK-PPEG, is very meaningful because it always instills educational values, knowledge, skills, attitudes and is open to receiving inputs, ideas, proposals from the community. However, finding an alternative solution to clear the bush land other than

burning the land, is not easy and apparently there is no viable solution yet. The Facilitator Team only strives to socialize the dangers and risks of peatland burning.

The model of group assistance or collaboration between peatland management stakeholders, namely the TK-PPEG, FM, FM Coordinator, experts from PMO SMPEI, Provincial and District Environmental Offices, and from elements of the Ministry of Environment and Forestry, is very meaningful and has been able to educate the community at the lower level to model the cooperation and group effort, especially when conducting field visits and monitoring evaluations.

The TK-PPEG has gained extrinsic motivation with the presence of a mentoring team and related stakeholders, as well as being able to support and foster intrinsic motivation. (POAR, 2020, QD1 - QD6).

The most needed future assistance is the institutional empowerment of TK-PPEG so that it continues to exist sustainably; also improve knowledge and skills for crop cultivation (other than palm oil trees), post-harvest processing, marketing, working capital for peatland management, and partnerships with institutions or institutions whether government, private or companies and financial institutions. (POAR, 2020, QD11, QE2 - QE5).

SMPEI's assistance for the construction of canal bulkheads and plots (agriculture and fisheries), is of great benefit. The TK-PPEG and the public can learn firsthand about the construction of canal bulkheads that use appropriate technology, at a relatively inexpensive cost, and understand how to plan and utilize and maintain them. Agricultural and fishery plots are also very beneficial, especially for short-term crops such as vegetable crops. The results are directly appreciated and provide a motivation boost to use peatlands in a more productive way. Having demplots in the peatland, people visit peatland more often, so that it consequentially plays a role in monitoring the peatlands, including in the event of a fire disaster. (POAR, 2020, QF1 - QF5).

Conclusion

1. The role of stakeholders in the process of facilitation and empowerment-based assistance is a determining factor in the successful implementation of the SMPEI project in Tapak / Desa / Kelurahan.
2. The TK-PPEG as a forum for community participation and empowerment is a strategic and appropriate solution; and
3. Stakeholder collaboration is instrumental in improving the function of the peatland ecosystems, initiating the revitalization of peatland-friendly productive economy, which is integrated with the transfer of knowledge, skills and capacity building of the human resources.

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Attachment:

**STAKEHOLDER SURVEY
PUBLIC OPINION AND ACTION RESEARCH (POAR)**

A	Role and Function of Peatlands	Score
A1	As an environmental asset, peatlands need to be conserved	1 2 3 4 5
A2	Peatlands as a source of life	1 2 3 4 5
A3	Peatland as an economic asset	1 2 3 4 5
A4	Peatland as an environmental asset	1 2 3 4 5
A5	Peatland as an asset towards prosperity	1 2 3 4 5
A6	Peatlands are only suitable for palm oil	1 2 3 4 5
B	Peatland Utilization and Management	Score
B1	Peatlands have not been managed properly	1 2 3 4 5
B2	Peat farmer knowledge & skills are still limited	1 2 3 4 5
B3	Peatland management is more difficult than mineral land	1 2 3 4 5
B4	Peatlands are more suitable for community management	1 2 3 4 5
B5	Peatlands are more suitable for company management	1 2 3 4 5
B6	The community should be fully involved in planning, implementing, utilizing, maintaining, monitoring, and developing programs	1 2 3 4 5
B7	There needs to be a specific policy regarding the management of corporate peatlands	1 2 3 4 5
B8	Clearing peatlands can only be by burning	1 2 3 4 5
B9	In addition to burning, the strategy of cultivating the land (clearing or cleaning the land) for agriculture on peatlands is by means of:	
B10	Strategies for managing agricultural plots on peatlands:	
B11	The most suitable plants on peatlands:	
B12	Types of fish that live in peatland canals :	
C	Peatland Fire Status	Score
C1	Peatland fires caused by deliberate burning	1 2 3 4 5
C2	Peatland fires caused by deliberate burning	1 2 3 4 5
C3	There is no solution to clean peatlands other than to burn them	1 2 3 4 5
C4	Peatland burning still occurs because no solution is given to farmers	1 2 3 4 5
C5	Peatland restoration programs by the Government is not yet completed	1 2 3 4 5
C6	Criminal sanctions imposed to peatland-burning farmers	1 2 3 4 5
C7	Who is most responsible in the event of a peatland fire?	
C8	Why peatland fires continue to occur :	
C9	If any community member is found to be burning peatland for farming, what sanctions should be imposed ?	
C10	Strategies for fighting fires on peatlands :	
D	Peatland Assistance and Restoration	Score
D1	As a Natural Resource Asset, peatlands need to be managed professionally by experts	1 2 3 4 5
D2	The government's peatland restoration is currently unsuccessful because it is carried out by non-experts	1 2 3 4 5
D3	Need mentoring and assistance for peatland farmers	1 2 3 4 5
D4	Mentoring and assistance for peatland farmers by NGOs/NGOs	1 2 3 4 5
D5	Coaching and Assistance for peatland farmers by universities	1 2 3 4 5

D6	Guidance and assistance for peatland farmers by the Government	1	2	3	4	5
D7	The government needs to prepare funds to fully support peatland management	1	2	3	4	5
D8	Government employees cannot work optimally for peatland management due to other programs	1	2	3	4	5
D9	Government assistance for peatland farmers is not yet 100% due to the workload in the workplace	1	2	3	4	5
D10	Government officials' knowledge on peatland management is limited	1	2	3	4	5
D11	Post-harvest mentoring is very important	1	2	3	4	5
E Peatland Management Capital		Score				
E1	Communities can contribute to peatland management business capital	1	2	3	4	5
E2	Peatland management does not cost much if involving local communities	1	2	3	4	5
E3	The source of funds for business capital is a joint fund from loans and non-governmental organizations	1	2	3	4	5
E4	Knowledge/skills are essential for peatland management	1	2	3	4	5
E5	Business skills are essential for peatland management	1	2	3	4	5
F Construction of Canal Bulkheads and Plots		Score				
F1	Canal bulkhead construction program in each canal (community and corporate land)	1	2	3	4	5
F2	Construction of canal bulkheads on community land are limited	1	2	3	4	5
F3	Agricultural plot program on peatlands	1	2	3	4	5
F4	Fisheries plot program on peatlands	1	2	3	4	5
F5	Infrastructure development on peatlands to prevent fires, based on appropriate technology	1	2	3	4	5
G TK-PPEG Institutions and Human Resource Capacity Building		Score				
G1	Establishment of TK-PPEG for peatland management	1	2	3	4	5
G2	Establishment of TK-PPEG for human resource empowerment	1	2	3	4	5
G3	Need an understanding of the institutional dynamics of TK-PPEG	1	2	3	4	5
G4	Require upskilling of the TK-PPEG members	1	2	3	4	5
G5	Knowledge enhancement for TK-PPEG members is needed	1	2	3	4	5
H SMPEI (Sustainable peatland management)		Score				
H1	Knowledge of SMPEI program	1	2	3	4	5
H2	Assistance from SMPEI Facilitators	1	2	3	4	5
H3	Realization of RKM plans by SMPEI	1	2	3	4	5
H4	The need for assistance by the Facilitator	1	2	3	4	5
H5	Knowledge & skills are enhanced by the Facilitators	1	2	3	4	5
I Partnership						
I1	TK-PPEG partners in villages/kelurahan :					
I2	TK-PPEG partners outside the Village /Kelurahan :					
I3	Facilitation of partners by the Facilitator :					
J Recommendations						
J1	Suggestions/recommendations for the Environment Agency :					
J2	Suggestions/recommendations for Village/Kelurahan Governments :					
J3	Advice/recommendations for NGOs/NGOs .:					



- J4 Advice / recommendations for Business Institutions / Economic Institutions :
- J5 Suggestions/recommendations for Universities (Colleges) :
- J6 Suggestions/recommendations for Facilitators :
- J5 Advice/recommendations for the community :.

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