Human resource capacity development strategy for forest and land fire control in Indonesia: a soft system methodology approach

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Abstract. Forest and land fires occur repeatedly in Indonesia and have caused adverse impacts. Forest and land fires in Indonesia are almost entirely due to human behavior, therefore it is actually more preventable and controllable rather than natural-induced fires. The low capacity of human resources (HR) in controlling forest and land fire became one of the important causes of why the fire in Indonesia is still often difficult to control. This study aims to formulate a model of HR capacity building strategy of forest and land fire controlling in Indonesia with a soft system methodology approach, involving several expert respondents who also represent various related stakeholders. This method describes the problem-solving flow based on a mutual agreement through the stages of describing problem situations, building a conceptual model, comparing the model with the real world and taking corrective action of the problematic situation. This research contributes three conceptual models of HR capacity development activities, they are developing a system/pattern of HR capacity development for effectiveness and program synergy, developing more meaningful capacity building program through the internalization of spiritual values, and developing institutional capacity in the framework of community HR capacity optimization.
Key Words: forest and land fire, human resource capacity, soft system methodology.

Introduction. Ecologically, forest fires are actually a natural phenomenon, and even certain ecosystems have adapted to fire (Syaufina 2008). Forest fires are a serious threat to the world when people deliberately burn the forest to clear land, either by field contractors, swidden cultivators or business actors (Saharjo 2016). Uncontrolled fires can lead to dramatic loss of habitat, generate air pollution, and increase CO_2 in the atmosphere (Miller & Spoolman 2009). In Southeast Asia, the impact of fires can affect global climate change, which could lead to greater misery and hardship for humans (Page et al 2013). On certain lands/forests landscape, exacerbated by climate change, fires will be extremely difficult to control and are at great risk to human safety and infrastructure, therefore people living in those areas should be ready and not just rely on firefighters in fighting fires (Stephens et al 2013). Recurring forest and land fire incidents have consequences for the need for more serious handling, taking into account all related aspects.

Unlike in some other countries where natural factors are often the main cause, in Indonesia, human factors account for almost 100% of forest and land fires (Syaufina 2008; Saharjo 2016), both intentional and unintentional. The research of International Council for Research in Agroforestry (ICRAF) in Sumatra and Kalimantan shows that the forest and land fires that occurred mainly due to human activities in the form of opening fire in land clearing, burning due to land conflicts, unintentional spreading of fire and natural resources extraction activities (Syaufina 2008). The fact that human factors are the main cause of forest and land fires in Indonesia indicates that fires are potentially

anticipated before they occur. Human resource (HR) capacity is one aspect that plays an important role in supporting the efforts of effective and sustainable forest and land fire control, and therefore its development is expected to play a major role in preventing and controlling recurring forest and land fire in Indonesia.

Several studies have shown that the low capacity of HR remains one of the important factors affecting the occurrence of forest and land fire in Indonesia (Sukrismanto et al 2011; Evayanti & Zulkarnaini 2014; Muttaqin et al 2015; Nurdianto et al 2016). The role of qualified HR will be increasingly needed as the population increases while its dependence on land burning activities cannot be reduced. The challenge becomes more severe due to the phenomenon of climate change. Climate change projections can result in more forest and land fire in the future (Stephens et al 2013).

Some experts provide definitions around understanding capacity development. The United Nations Development Programs (UNDP) explains the meaning of capacity as the ability of individuals, institutions, and communities to function, solve problems, and establish and achieve goals on an ongoing basis (UNDP 2009). Capacity development can be recognized as a process whereby people, organizations, and society as a whole release, strengthen, create, adapt and maintain capacity over time (OECD 2006). In particular, capacity development is a multi-level learning process, which links ideas to action. Capacity building, in this view, can be defined as continuing learning (Morrison 2001).

The low capacity of HR for the control of forest and land fire is directly or indirectly related to the low impact of the capacity development program that has been done. The HR capacity of forest and land fire control needs to be built and developed to ensure optimal contribution to the efforts of forest and land fire control in Indonesia in a sustainable way. This study aims to formulate strategies in developing forest and land controlling HR capacity. This strategy can be used as a reference to improve or build the system of resource capacity development in support of forest and land fire effective control, particularly in Indonesia.

Material and Method

Description of the study material. The study has been conducted from October 2017 to March 2018, the forest and land fire control HR referred to in this study is operational task forces from elements of central government, regional/local government and community.

The main data used in this research is the primary data obtained from structured interviews of expert respondents, representing the various stakeholders. In addition to in-depth interviews, primary data were also obtained through limited, non-formal discussions. While secondary data comes from various reports and documents related institutions, as a supplementary and support information obtained from expert respondents. The number of experts interviewed include fifteen experts, derived from the Extension and HR Development Agency of Environment and Forestry (BP2SDMLHK, Badan Penyuluhan dan Pengembangan Sumber Daya Manusia Lingkungan Hidup dan Kehutanan) (four persons), Directorate General of Climate Change (Ditjen PPI, Direktorat Jenderal Pengendalian Perubahan Iklim) (three persons), the Directorate General of Plantation (Ditjenbun, Direktorat Jenderal Perkebunan) (one person), academician (one person), local government (one person), National Disaster Management Agency (BNPB, Badan Nasional Penanggulangan Bencana) (one person), non-government organization (one person), forest utilization permit holders (one person), head of a forest management unit (one person), and Indonesian forestry profession certification institute (one person).

Methods. This research applies the Soft System Methodology (SSM) approach. SSM is a qualitative approach to solve unstructured complex problem situations with the system thinking approach, introduced at Lancaster University of England by Peter Checkland in 1981. The essence of SSM is how to use and apply ideas to develop in the face of problems to solve, where the situation and problems encountered can only be described

as general or vague. Therefore SSM is an approach that systematically seeks to establish and structure the debate on the actions or steps necessary to improve the situation of the problem (Simonsen 1994). The essence of SSM is how to use and apply ideas to be developed in the face of problems to be resolved, where the situation and problems encountered are obscured and can only be described in general. Purnomo (2012) explains that SSM can be regarded as a learning system for the complex situation faced by human and produce actions for improvement. The actions should make sense to all parties involved. The action is a hypothesis which will then be tested in the real world.

SSM links two types of activities, real-world activities involving people in problematic situations, and system thinking activities in which the researcher (in some way) tries to abstract the real world into his system of thinking, which can be done without involving the participation of the person involved in the problematic situation (Simonsen 1994). The foundation of the research step in SSM is the seven steps introduced by Checkland (1981) (Figure 1).
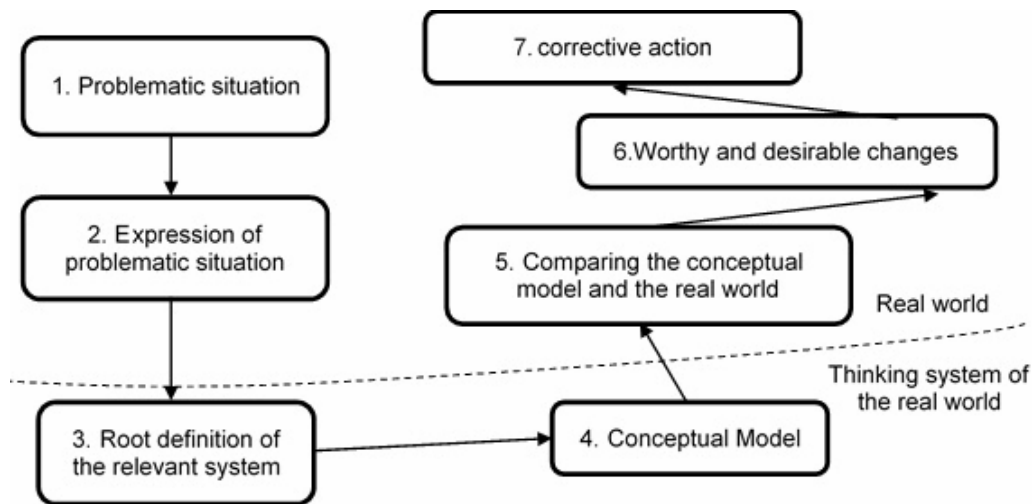

Figure 1. Soft system methodology (Source: Checkland 1981).

The SSM method has experienced various developments in the formulation. Since 1990, based on these seven steps, a new formulation of SSM stages have been introduced, in which the steps of the seven steps are made to become more flexible. SSM's new concept includes four main activity points, namely: 1) finding a problematic situation; 2) formulating a conceptual model of targeted activity (purposeful activity models); 3) arguing/comparing situations, between conceptual models and field facts/the real world; and 4) taking action on the situation toward improvement (Checkland 2000). The problematic situation is approached by considering the socio-political aspect and enriched by the rich picture. Building a conceptual model of directional activity (PAM, Purposed Activity Model) begins with defining Root definitions, identified by the PQR method (do P by using Q, to play a role in achieving R). Furthermore, to further ensure that the root definition can be used as a modeling tool, it is followed by CATWOE analysis (described in Table 1). As a criterion of PAM performance measurement, generally used three criteria E (Efficacy, Effectiveness, and Efficiency). PAM describes system activity based on root definition and imperative word structure with reference to basic logic. Benchmarking conceptual model and the real world is done through a series of interviews and discussions on related or interested parties, to ascertain whether the concept of a model that has been created can run on the field. As the final part, the study proposes the concept of change that may be proposed by PAM to be implemented in the field in order to improve the situation, without to perform the corresponding action.

Table 1
Elements and definitions of CATWOE

CATWOE elements	Definition
Customer (C)	The beneficiary or the victim when the transformation is implemented.
Actor (A)	Parties conducting transformation activities.
Transformation (T)	The process of converting inputs into outputs.
Weltanschauung (W)	Framework of view of the benefits in the context of the transformation process.
Owner (O)	The parties in power on the system, which can change or stop the transformation.
Environmental constraint (E)	Elements of environmental constraints.

Source: Adapted from Checkland & Scholes (1990).

Results and Discussion

Description of problematic situation of forest and land fire control HR. Based on in-depth interviews with expert respondents and some focused discussion series, several problematic situations related to the capacity development of forest and land controlling HR were identified. The first part describes the parties involved in this research, then the problematic situation is described narratively with an explanation of the related social and political situation. In the next section, the state of the problem is also shown through rich picture (Figure 2). Rich picture helped illustrate the detail and rich, which is displayed in the form of pictures or diagrams, capture informally core of the problem, the structure and the viewpoint of the situation, running processes, actual issues were recorded, and the potential issues that will occur (Triyonggo 2016). Both forms of explanation can be complementary.
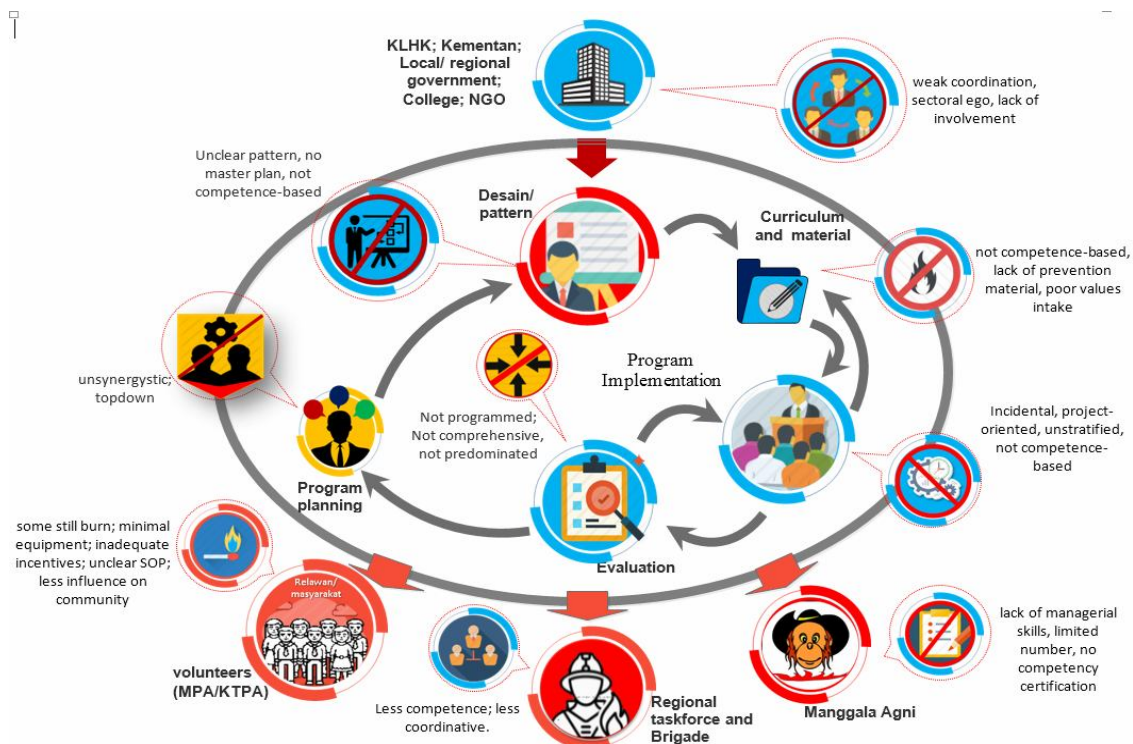

Figure 2. Rich picture of problematic situation.

The parties involved in the SSM are identified by the client, the practitioner and the problem owner (Checkland & Scholes 1990). In this study, the Client is the researcher (Mochamad Asep Maksum), Chief Advisor (M. Syamsul Ma'arif) and member of the supervising (Lailan Syaufina and Diah Zuhriana). The practitioner is the researcher

himself, while the issue owner are the Ministry of Environment and Forestry (KLHK, Kementerian Lingkungan Hidup dan Kehutanan) through BP2SDMLHK and Ditjen PPI as the program implementer, Ministry of Agriculture (Kementan, Kementerian Pertanian) through Ditjenbun, local government (consisting of provincial, district and village governments), forest and land fire control operational taskforces, and community element. The description of the identified problem situation is broadly grouped into the following four major sections.

The capacity of forest and land fire controlling HR is not as expected. Characteristics of group membership of forest and land fire controlling HR can be classified into two major categories that are core personnel and volunteer. The core personnel are employees and/or contract workers incorporated in: forest and land fire control operational taskforce of central government (Manggala Agni), provinces and districts (Regional Task Force), and regional plantation wildfire Control (Brigade), while volunteers come from community members who have been trained with forest and land fires control skills, take a part in the Fire Concern Community (MPA, Masyarakat Peduli Api) and the Concerned Peasant Farmer Group (KTPA, Kelompok Tani Peduli Api) (KLHK 2016; Kementan 2018; DitjenPPI 2018a). Core personnel has the main task of controlling forest and land fires in their administrative areas, while volunteers play a role in assisting the implementation of forest and land fire control in the field around where they live.

Capacity, which can be interpreted as knowledge, skills, and attitudes among HR of control forest and land fires currently not considered optimal. The implementation of forest and land fires control in the field still relies too much on Manggala Agni, whereas Manggala Agni personnel are very limited and it is impossible to reach all forest and land and forest fires events spread all over the region. The capacity of HR controlling forest and land fires under regional/local government is still low and has not received serious attention. Most organizations have been formed only at the provincial level. In forest and land fire control, most of its personnel only play a role in administration, especially related to project activities. They do not have special skills in controlling forest and land fire, and more of a role as a facilitator of activities.

Volunteers consisting of MPA and KTPA who have a role to assist forest and land fire control activities, currently most do not yet have adequate capacity/capability. Their capacity and role for fire prevention and for raising public awareness are still low. With the potential of large numbers and scattered to the site level, optimization of this group should have an important effect on the effectiveness of forest and land fire control. They are the ones who will find the fire when it happens firstly and are still in a limited sphere, they also mostly have information and access to the arsonist in the community. Optimizing the role of this community group are could be by increasing the ability to collect data predicting and anticipating the fire that will occur, and strengthen its role and capability as an agent of change in society.

The role of the parties in the development of human resource capacity of forest and land fire control is not yet optimal. Presidential Instruction (INPRES, Instruksi Presiden) No. 11 of 2015 on the Improvement of Forest and Land Fire Control instructs various government agencies to improve the control of forest and land fire all over the area through various forms, in accordance with their duties and functions (PresidenRI 2015). In the term of human resource capacity building of forest and land fire control, the INPRES specifically instructed to increase the role of KLHK and Kementan. Besides, this INPRES also instructed provincial and district governments to allocate the cost of implementing forest and land control in the Regional Revenue Expenditure Budget (APBD, Anggaran Pendapatan Belanja Daerah). Based on the facts in the field, the most dominant party in the HR capacity development of forest and land fire controlling is KLHK. The role of Kementan is currently not significant, and neither is the local government.

The local government currently seems to rely too much on the central government, both in the control of forest and land fire in general, as well as in the capacity development of HR. In fact, central government with limited resources (both

human and budget) is unlikely to be able to overcome the problems of forest and land fires in all regions of the country without the real involvement of the local government. Empirical data shows that most fires occur on community-owned land (outside of forested areas) (Akbar 2008; Cattau et al 2016; DitjenPPI 2018b), therefore the active role of local government as the controller of resource management in the region to be more involved in the control of forest and land fires becomes indispensable.

HR capacity building activities of forest and land fire control are not synergistic and not sustainable. The capacity building activities of HR for controlling forest and land fire are currently organized by KLHK through the Directorate General of PPI and BP2SDMLHK, and by Kementan through Ditjenbun. In the real field, the implementation of activities undertaken by these institutions is not synergy, each party has its own purpose and target. When one engages in an activity the other is not adequately involved. Activities undertaken also often overlap so that often there are some community groups obtain the same/recurrent capacity building materials with different organizers.

Within the internal KLHK, based on its duties and functions, BP2SDMLHK has the authority to play a major role in HR capacity development of KLHK scope, including HR of forest and land fire control. Nevertheless, the development of HR management capacity in BP2SDMLHK is not a priority, and therefore the proportion of planning and budgeting support is relatively small. Capacity building programs in BP2SDMLHK are more often sustained through cooperation with other institutions (especially international agencies). Another KLHK internal structural institution is Ditjen PPI. As a technical institution that has the main duties and functions of controlling forest and land fire, Ditjen PPI has adequate internal budgeting support. But in the scope of HR capacity development, Ditjen PPI has a limited role, covering only technical guidance and supervision (KLHK 2015).

Ditjenbun of Kementan as the organizer of HR for the control of forest and land fire for the area of non-forest and land plantation has authority in terms of mastery of management technology of without burning land clearing (Kementan 2018). Various empirical data indicate that compared to other causes, land clearing activity by burning is the largest cause of wildland fire in Indonesia (Syaufina 2008; Akbar et al 2011; Maswadi et al 2014), therefore the mastery of the unburned management technology becomes very important. Unfortunately, the transfer of knowledge and technology of without burning land management by the Directorate General of Plantation the Ministry of Agriculture is currently only concentrated on the organizations/groups they form (Brigade and KTPA) and has not been widely socialized to other personnel groups, especially those managed by KLHK.

Awareness and motivation of forest and land fire control task execution still low. Even if the level of awareness and motivation in the implementation of the task of HR controlling Forest and land fires cannot be generalized, but the lack of it can be seen from the high dependence on Manggala Agni during Forest and land fire execution. Meanwhile, controlling activities of Forest and land fire mostly still rely too much on financing budget support, whereas some forest and land fires control activities mainly preventive, should be able to keep running even in limited or even without funding support.

Conceptual model (PAM, Purposeful Activity Models). Conceptual models are generated on root definitions and CATWOE analyzes that have been identified from problem situations. Based on the problem situation, three root definitions of the HR capacity building strategy of Forest and land fire control were obtained and three conceptual models of activity were constructed.

Activity Model 1. Activity model is generated base on root definition and CATWOE elements. Root definitions 1 built is "developing a pattern for forest and land fire control capacity building (P), by optimizing the roles of related parties/stakeholders based on their respective functions and duties (Q) for the integration of HR capacity development

program of forest and land fire control (R)". The CATWOE analysis for root definitions 1 is contained in Table 2.

CATWOE elements of root definition 1

CATWOE elements	Result definition
Customer (C)	Manggala Agni, Regional Task Force, Brigade, MPA and KTPA.
Actor (A)	BP2SDMLHK, Ditjen PPI, Ditjenbun, Provincial/regency government, college, non-govermental organization.
Transformation (T)	The development of HR capacity building program of forest and land fire control from unpatterned and uncoordinated becomes patterned and synergistic.
Weltanschauung (W)	The capacity building planning pattern is important as a reference for a more effective program implemented in forming reliable forest and land fire controlling HR.
Owner (O)	KLHK, Kementan.
Environmental constraint (E)	HR Capacity building of forest and land control is not yet a priority among stakeholders.
3E Performance Measurement Criteria	
Efficacy	Active engagement and coordination among stakeholders in the system.
Efficiency	Minimum resource use of time, human and cost.
Effectiveness	An integrated and implemented capacity building pattern can be developed.

Source: Data generated from in-depth interview and FGD.

The conceptual model of activity generated from root definitions 1 and associated CATWOE analysis is as shown in Figure 3.
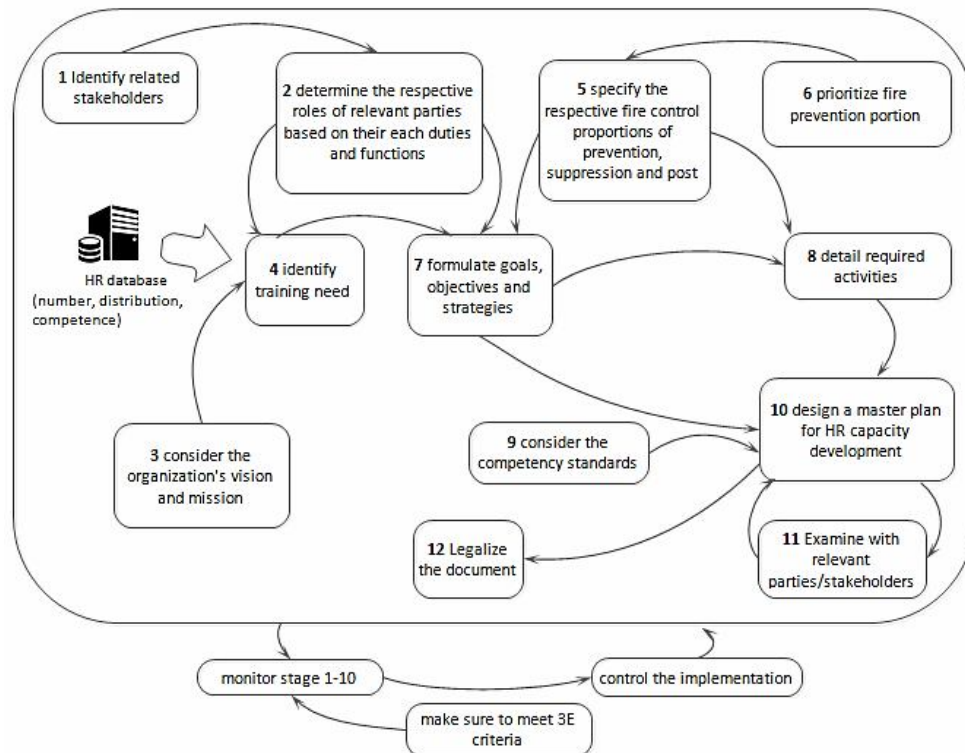

Figure 2. Conceptual model Activity 1.

Activity Model 1 shows the stages of activities in formulating a master plan on developing the HR capacity for controlling forest and land fire which is mutually agreed and

optimizing the involvement of the related parties (across sectors). Cross-sector collaborative design planning should accommodate as much of each sector interest as possible, and consider processes, structures and inter-sectoral interactions in such a way as to achieve the expected objectives (Bryson et al 2015).

Activity Model 2. Root definitions 2 as the basis for the building Activity Model 2 is "developing a more meaningful capacity building program (P) through internalizing spiritual values (Q) to improve awareness, motivation, and performance of forest and land fire control HR". The CATWOE analysis for root definitions 2 is contained in Table 3.

Table 3

CATWOE elements of root definition 2

CATWOE elements	Result definition
Customer (C)	Manggala Agni, Regional Task Force, Brigade, MPA and KTPA.
Actor (A)	BP2SDMLHK, Ditjen PPI, Ditjenbun, Provincial/regency government, college, non-govermental organization, local government, religion institution.
Transformation (T)	Awareness, motivation and role of HR from low/less becomes increase/high.
Weltanschauung (W)	Internalizing important values in the capacity building program is important to make the more meaningful/ influential program in improving HR performance.
Owner (O)	KLHK and Kementan.
Environmental constraint (E)	the parties involved may not feel comfortable because they are used to be the old pattern.
3E Performance Measurement Criteria	
Efficacy	Examples are shown by all parties involved in the system in applying values.
Efficiency	Minimum resource use of time, human and cost.
Effectiveness	Increased awareness and motivation of HR in carrying out its duties.

Source: Data generated from in-depth interview and FGD.

Root definitions 2 and its CATWOE analysis yield the Conceptual Model of Activity 2 in Figure 4.
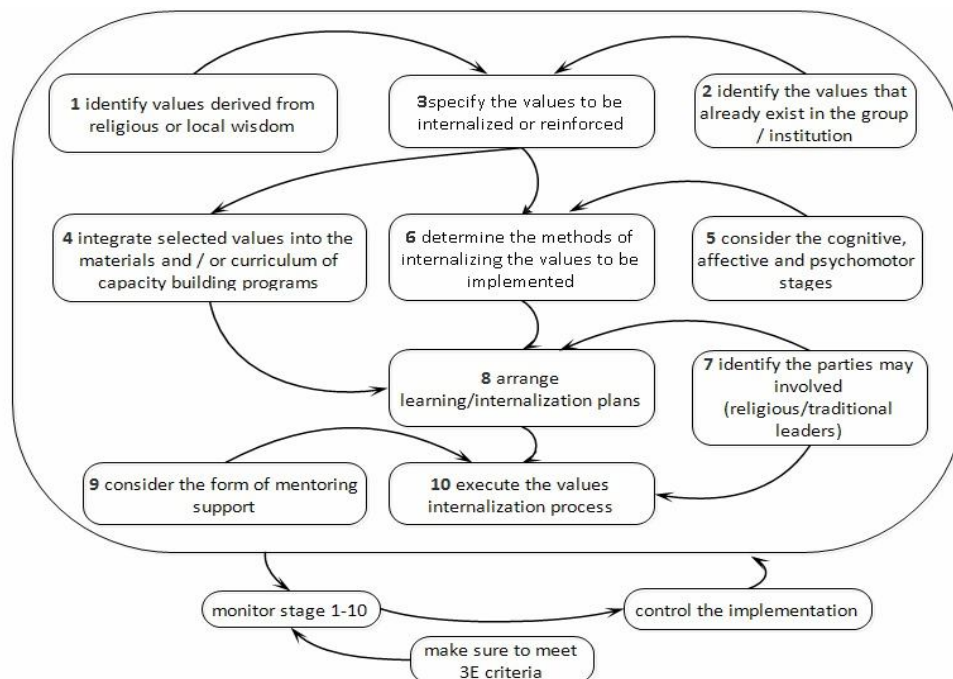

Figure 4. Conceptual model Activity 2.

Activity model 2 shows the steps that can be done in the context of the internalization of spiritual values in the HR capacity building program. Spiritual values can be moral, character or other fundamental values that can direct a person's behavior to think and act well. In Indonesia, these fundamental values come from religions and long-established local wisdom, which has been running in everyday life. Internalization of those values is expected to lead to improved performance execution of tasks. Improving the understanding and implementation of spiritual values in work can be more effective in enhancing HR engagement with organization, responsibility, loyalty and reducing dependence on material values (Dehaghi et al 2012; Singh & Prashant 2016), and in directing one to develop moral responsibility in preserving nature (Cooper et al 2016).

To develop a capacity building or training program to be more effective in formatting positive behaviors, the transformation process begins with the planning process or learning design (Dunlap et al 2000). This transformation process gives more meaning to the HR capacity building program, by adding quality of value to each learning dimension aspects (cognitive, affective and psychomotor) through the internalization of spiritual values.

Activity Model 3. Root definitions 3 defined as the foundation to build Activity Model 3 are: "developing strong institutional capacity (P) by increasing participation of related parties/stakeholders (Q) to optimize role and capacity of community HR for forest and land fire control". The CATWOE analysis for root definitions 3 is presented in Table 4.

Table 4

CATWOE elements of root definitions 3

CATWOE elements	Result definition
Customer (C)	MPA, KTPA and other community volunteers.
Actor (A)	BP2SDMLHK, Ditjen PPI, Ditjenbun, local government (provincy, regency, village), college, non-govermental organization.
Transformation (T)	The role and capacity of HR forest and land fire controlling from community element to be more optimal.
Weltanschauung (W)	Increasing the role of stakeholders in developing the community institution of forest and land fire control becomes more strong and stable.
Owner (O)	BP2SDMLHK, Ditjen PPI, Ditjenbun, local government (provincy, regency, village).
Environmental constraint (E)	Local governments generally prioritize physical / infrastructure development in their development planning.
3E Performance Measurement Criteria	
Efficacy	Increasing the awareness of stakeholders in developing the capacity of community HR.
Efficiency	Minimum resource use of time, human and cost.
Effectiveness	Capacity building of community HR of forest and land fire control integrated in regional development planning.

Source: Data generated from in-depth interview and FGD.

By the context, the development of institutional capacity can be limited in scope, with more emphasis on the attributes of problems described in Rich Picture. Based on Rich Picture, institutional attributes may be focused by adopting institutional attributes contained in Presidential Regulation 59 the Year 2012, which includes the capacity building of organizational structure, the implementation of task and function, productive organizational culture, budget/financing capacity, infrastructure/ equipment, and working standard (PresidenRI 2012).
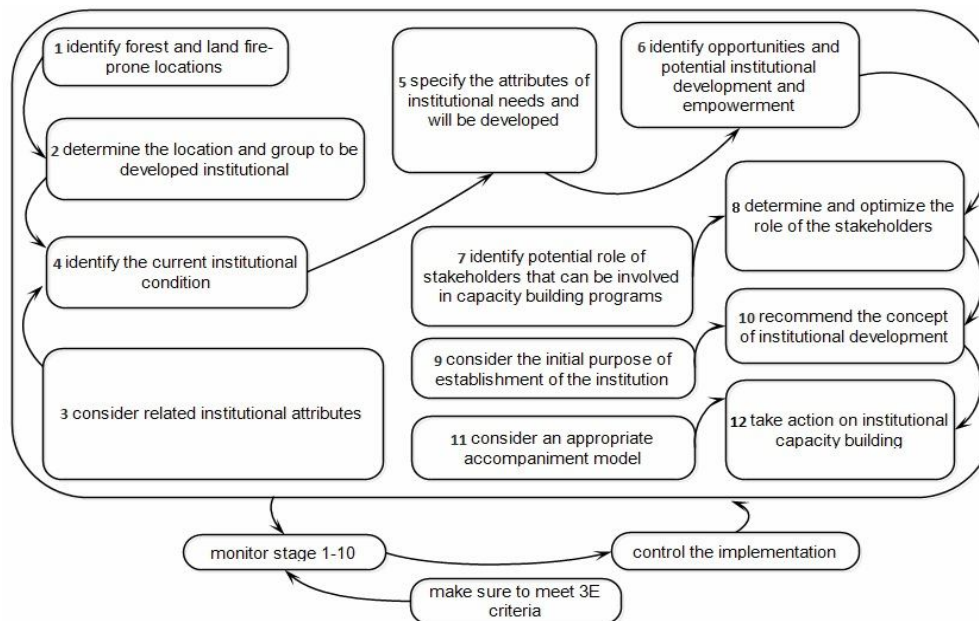
Figure 5. Conceptual model Activity 3.

Conceptual model and real world comparison, and corrective/improvement action. The last two steps of the Soft System Methodology approaches are comparing conceptual models that have been built with real-world conditions, and corrective actions (Table 5). Conceptual model comparison information with the real world is obtained through confirmation interviews, especially to those who will implement the activity model resulting from this research. Corrective action step in this research is a form of corrective action recommendations based on real-world conditions, while the actual corrective action is the domain of the Owner, which in this case is the holder of the HR capacity building policy of forest and land fire control.

Table 5

Comparison and recommendation of corrective/improvement action

Activity model	Real world condition	Recommendation
Developing the HR capacity development pattern of forest and land fire control	- Currently, there is no master plan for HR capacity building of forest and land fire control, each organizer makes their own reference; - In planning and organizing HR capacity building activities, the organizers tend to 'work alone', less consider the capacity / domain of a more appropriate organization.	The HR capacity development pattern of forest and land fire control contained in the master plan should accommodate the optimization of the parties role based on the domain/task and organizational functions.
Internalization of spiritual values in the HR capacity development of forest and land fire control	- Capacity-building activities are currently focused solely on changing knowledge, skills, and attitudes, less the value expansion; - The spiritual values of each region may differ according to their beliefs.	- Method and material must not general, but are contextual and adapt to the local environment and communities needs; - The methods and materials of the internalization process should not be general, could be contextual and adapt the beliefs of the local community.
Development of community HR institutional capacity of forest and land fire control	- Institutions that support the HR community capacity vary, most are not stable, but some of them also have a stable and independent organization; - Community capacity building still relies on central government funds.	- Institutions are developed to meet needs, can be advisory, facilitation or promotion; - Integration and optimization of local and regional budget planning (Local Action Plans).

Source: Data generated from in-depth interview and FGD.

Conclusions. This research captures the main problems in developing the capacity of HR controlling forest and land fire, including the low capacity of forest and land fire control HR, the not optimal role of the related parties, the not synergistic and non-sustainable capacity building program, and the low level of awareness and motivation of Forest and land fire control task execution. As part of the effort to solve the problem situation, this research recommends three strategies to be developed. The findings, which are also recommendations from this study emphasize the importance of human resource awareness and motivation in controlling forest and land fires by developing more meaningful capacity development program. The findings also stress the importance of synergy among stakeholders in planning human resource capacity building programs to control forest and land fires in Indonesia, and the need to optimize the role of community workers through institutional development.

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