MONITORING ENVIRONMENTAL POLICY PROCESS:

INDICATORS TO EVALUATE PERFORMANCE

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ABSTRACT

The complexity of environmental policy development was examined in relation to sustainability, holistic and systems-thinking perspectives. We studied potential application of systems principles of *coordination*, *representation*, *collaboration*, *participation* and *teamwork* to improve policy effectiveness at formulation, communication, implementation, and operationalisation of the environment policy in Uganda. The research unveiled the ineffectiveness of the Uganda National Environment Management Policy. We applied systems theory to develop a mechanism for monitoring effectiveness of environmental policies at national level, with the goal to identify key monitoring indicators. We used the soft systems methodology to identify occurring environmental problems causing forest loss. Results suggest that a systems thinking perspective, involving multiple stakeholders in a holistic decision-making process, can contribute to empowering people and institutions to install and follow an effective policy process. We recommend customizing the checklist and model to monitor the quality of environment policy processes in country-specific situations similar to those in Uganda.

Keywords: Environment policy, Sustainability, holistic strategies, systems-thinking, policy monitoring

INTRODUCTION

This paper looks at identifying indicators to monitor the quality of the entire environment management policy process. This is because the quality of an entire policy process determines how successful the policy will be in terms of its performance outcomes (Hallsworth, 2011). Assessing the quality of environmental policy processes requires practical indicators of successful performance and its impacts. Appropriate indicators are considered through the entire policy process (Genter, Susan, & Bailey, 2008). To understand this concept, we took the case of Uganda, a land locked country on the equator, bordering the Democratic Republic of Congo (DRC) to the West, Southern Sudan to the North, Kenya to the East, Tanzania to the South and Rwanda to the South West. The country covers an area of 236,000 km^2 and is one of the smallest states in East Africa.

Figure 1: Map of Uganda

Source: https://www.mappr.co/political-maps/uganda-map/

The research question is, why are there high rates of natural resource degradation in Uganda in spite of existence of documented national policies? In Uganda, there were governance inadequacies, and ineffective institutional performance under the crushing military dictatorship, from 1972 to 1985, a period in which exploitation of forests escalated. In retrospect, this could be termed a massive tragedy of the commons with no guidance, appropriate laws, and no enforcement, hence high rates of natural resource degradation (Hartter & Ryan, 2009). To address the high rate of natural resources degradation, an act of parliament created Uganda's new constitution in 1995 which incorporated

the management of natural resources into the national agenda. The aim was to formulate, implement, and enforce a policy that would raise awareness of environmental conservation. This process resulted into the National Environment Management Policy (NEMP) of Uganda (Rep. of Uganda, 1995). Other key related policies for environmental management included the Water Policy Act (1997), National Forestry and Tree Planting Act (2003), National Land Use Policy (2013), and National Climate Change Policy (2015). But over two decades now, even with all these national policies in place, there are still measurable negative effects on the status of Uganda's natural resources, including forest cover decline from 24% of the national land area in 1990 before new policies were enacted down to 9% in 2015, after several key policies were enacted (Rep. of Uganda, 2016). Compared to other natural resources related policies from 1995-2015, the NEMP served as the broadest spectrum policy, offering a more consolidated understanding of the impact of a successful policy process on natural resources. Our research has two main arguments.

In the first place, we argue that the current rate of forest resources decline in Uganda is unsustainable and cannot lead to sustainable development. Sustainability or sustainable development is a concept that has evolved since the 1980's (Wu, 2013). Accordingly, the most fundamental definitions of sustainability include the "Brundtland definition, the triple bottom line, weak versus strong sustainability, human well-being and ecosystem services" (ibid, pg. 1000). In this paper, we elucidate some of these fundamental definitions of sustainability. The Brundtland report (1987) derives sustainability from sustainable development and defined as a situation that promotes meeting the needs of the present without compromising the ability of future generations to meet their own needs. In this era, the Brundtland definition of sustainability has continued to thrive as it is also supported by the green growth paradigm of sustainable development (Organization for Economic Cooperation and Development; (OECD, 2011). Among the dominant approaches to sustainability is the one in which the three pillars including environment, economy and society support each other (Wu, 2013). That to achieve sustainable development, the environment ought to be in position to provide economic and social development, also known as triple bottom line sustainability or people' Planet and Profit" (ibid). Thus sustainability requires balancing the three pillars. According to Wu (2013), sustainability can be measured as weak or strong sustainability. Weak sustainability disregards environmental quality while promoting economic development; common in the industrialized era, in which man-made resources replace natural resources. Strong sustainability promotes the balance between man-made and natural resources because these are regarded as complements rather than substitutes (ibid). The ecosystem services definition of sustainability relates to the ability of the environment to meet the needs of human beings (Wu, 2013). Thus we ought to identify the earth's life support systems and manage these sustainably. Accordingly, the Ugandan NEMP perceives the concept of sustainability as something of importance as seen from the policy's broad objective and principles (Rep of Uganda, 1995). Unless there are holistic considerations of the entire policy process, achieving sustainability might be a myth. This leads to our second argument.

Secondly we argue that, to achieve sustainable environmental systems, we need to deal with the holistic potential of the NEMP, by focusing on the entire NEMP process, and to identify key indicators to monitor the entire policy process in terms of its outcomes (Hallsworth, 2011). Therefore, research in Uganda identified several outcomes at the environment policy formulation, implementation and operationalization stages (Namanji, Francis & Ssekyewa, 2016;

2017, Namanji, Francis, Ssekyewa & Lieblein, 2019). Other studies by Buyinza and Teera (2008), Egeru, Kateregga, and Majaliwa (2014), Namaalwa, Sankhayan, and Hofstad, (2007), Namaalwa and Hofstad (2007), Slette, Vedeld, and Kaboggoza (2008), Petursson, Vedeld, and Kaboggoza (2011) as well as Vedeld, Angelsen, Sjaastad, and Kobugabe (2004) identified similar outcomes but did not examine the entire policy process nor identify indicators for monitoring each step. This underscored the importance of conducting the current study, where we focused on identifying indicators to assess the quality of an entire NEMP process within the overall governance framework. Such indicators would be used to objectively monitor the quality of the environment policy process so as to ensure its effectiveness in bringing about sustainable management of natural resources. Hudson, Hunter and Peckham (2019, p. 5) showed that policy design and implementation are 'an integrated process rather than simply a series of discrete and distinct stages'. This implies a need for quality at all stages of the policy process.

The need for continuous collaboration with a range of stakeholders as seen in Hudson et al. (2019), is required at every policy stage. This is more so for environment policies because environmental systems are complex as indicated by Chen and Stroup (1993) and require holistic approaches to monitor the process of change. In holistic approaches, a systems thinking perspective would be embedded to examine the entire system of natural resource protection. Systems thinking is *'a way of seeing and talking about reality that helps us better understand and work with systems to influence the quality of our lives'* (Kim, 1999, p.2). Thus, systems enable interdependence and interrelatedness of all parts (ibid), and calls for a systems approach as "a way of thinking in terms of connectedness, relationships and context" (Gallopin,2003 pg.7). This implies that within an effective system, there would be participation, representation, teamwork, coordination and collaborative efforts rather than isolated production processes necessary for a successful NEMP process (Hammond, 1997; Kim, 1999; Laszlo and Krippner, 1998, p.11). Thus in this research, we based our theory on the ability of the NEMP to bring about sustainable environment systems through incorporating a holistic approach and a systems thinking perspective. In our analysis of systems thinking principles, we considered representation as different from participation because once participants are named from one sector, other sectors are not often represented. The later situation can be addressed by involving carefully invited participants from different sectors such that all sectors relevant to a particular system, for which the policy is being developed, are represented, thus developing sustainable systems. This is in relation to Barile, Quattrociocchi, Calabrese and Iandolo's (2018) argument about systemic approaches to sustainability. These authors argue that globally, sustainability implies "the recovery of …the system conditions, which include ecological and social aspects that are capable of putting into practice the theoretical principles of sustainable development through participatory processes" (ibid, p.3).

Therefore, the aim of this research was to identify key indicators to monitor the quality of the entire national environment policy process. The environment being a complex system, the policy process was considered to be best guided by systems thinking with the five listed principles, from which we designed indicators into a checklist and model for objective policy process monitoring. The focus was put on the quality of environment policies formulation, implementation and operationalization, starting with Uganda and recommending future customizing of our results in other related national environment policy situations.

MATERIALS AND METHODS

Analysing a successful policy involves careful identification of actions, including policy inputs to a system, for example finances, processes, politics and attitudes, as well as policy outcomes, including outputs and impacts to the system at each phase of the policy process, as conceptualized in Figure 2, (Dunn, 2014)

Figure 2. Conceptual framework for the application of systems thinking to the policy process in Uganda; outcomes from each step inform a process for the next cycle of planning
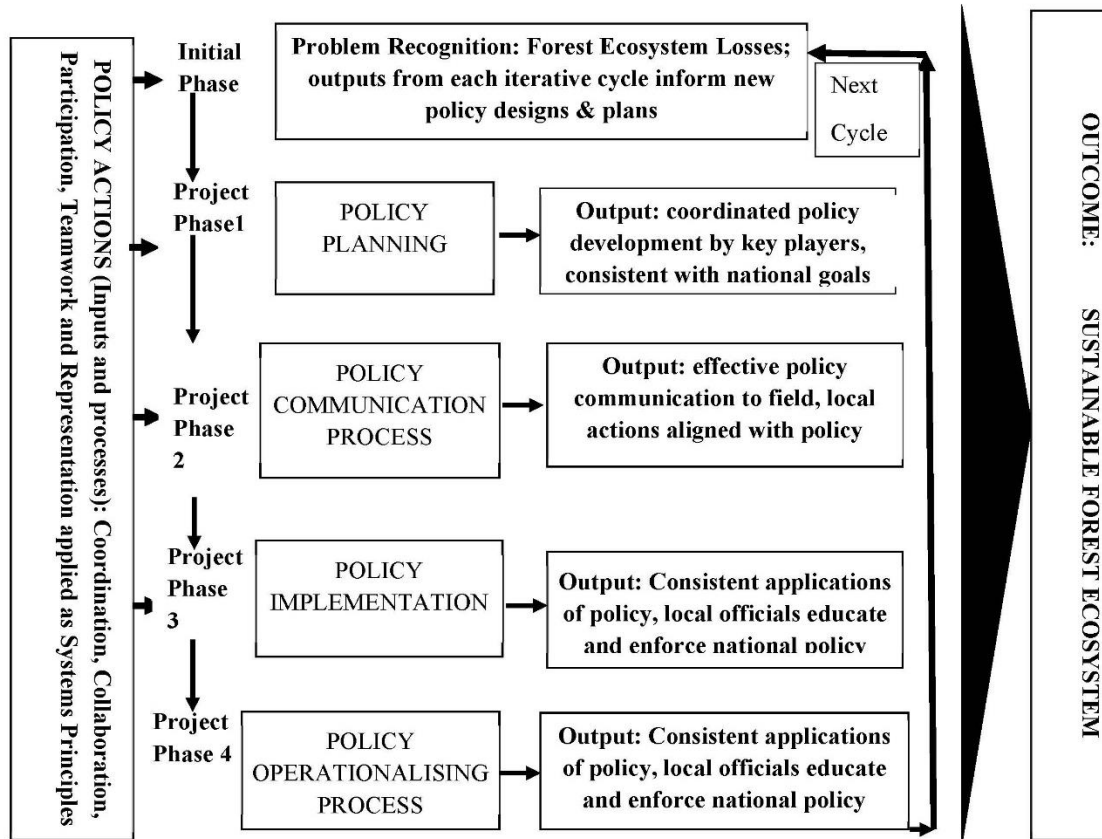
 The conceptual framework designates the policy phases in four practical and concrete steps including policy formulation, communication, implementation and operationalization (Figure 2). Each phase includes unique challenges found in any complex dynamic process, because they involve multiple systems sectors and agencies, various stakeholders with often conflicting interests, and cross-cutting issues. We recognize the complexity of the process, and in the real world these phases overlap and some occur simultaneously.

In the absence of process steps explained above, there results a challenge of an ineffective policy process. To address the challenge of an ineffective policy process, we applied a soft systems methodology based on the description given by Checkland (1981,2000), Checkland, Scholes and Checkland (1990) as well as Checkland and Poulter (2006). Soft

systems methodology is the most widely used and practical application of systems thinking (ibid). Soft-systems methodology is a 'sense-making approach, which once internalized, allows exploration of how people in a specific situation create for themselves the meaning of their world and act intentionally' (Checkland, 1981, p. 2). This methodology helps in solving complex problems and situations of deviation in defining the problem (Checkland & Poulter, 2006). In line with the above description of the soft systems methodology, we started the process of identifying indicators.

IDENTIFYING INDICATORS FOR THE PROPOSED CHECKLIST TO MONITOR THE EFFECTIVENESS OF THE ENVIRONMENT POLICY PROCESS

First, we built a picture consisting of indicators to guide effectiveness of the NEMP process towards restoration and conservation of the environment. Second, we subjected those indicators to a diversity of stakeholders with multi-sectoral representation to analyse the picture, and to determine the relevance of each indicator. Third, we determined the appreciation and applicability of the checklist and model given the social and political situation in which they were to be applied.

To build the picture of indicators, we referred to the previous research by Namanji et al., (2016; 2017; 2019), whereby five systems principles, namely coordination, collaboration, participation, teamwork, and representation, Hammond (1997), Hudson (2019), Kim (1999), Laszlo and Krippner (1998) were considered as 'inputs' applied during each of four policy process phases of formulation, communication, implementation and operationalization. Since the environment system is complex, we referred to the systems thinking theory from which we derived the above five systems principles. Therefore, we considered an effective policy process as one that is well aligned with the five systems principles.

By reviewing various cases reported in NEMA (2000; 2006; 2008, 2010; 2014) and other sources including Berkes and Folke (1998), Capra (1996), Gann and Lamb (2006), Hammond (1997), Holling (1978), Kingdon (1993), Laszlo and Krippner (1998), Namanji et al. (2016, 2017,2019), Ostrom (2014), Pritchard et al. (2014), Rep. of Uganda (1995; 2015a; 2015b; 2018); we generated actions implemented to align with the five systems principles, and we selected these actions as indicators of compliance or non-compliance for an effective NEMP process. In this case we used a document analysis method by Bowen (2009), which involved a forth and back interplay of literature. We scrutinized and compared literature content in order to have organized and categorized ideas, and to generate actions implemented to align with the five systems principles, as indicators of compliance or non-compliance for an effective NEMP process (Table 1)

Table 1. List of indicators identified from literature

S/N	Indicator
1	Establishing coordinating institutions.
2	Facilitating and directing institutional efforts.
3	Clear delineation and assignment of roles.
4	Engaging multi-stakeholder and multi-sector group representation (Gann & Lamb, 2006).
5	Establishing a baseline for measuring protection based on multiple interests and agencies.
6	Promoting intra- and inter-agency collaboration in policy design and implementation (Laszlo & Krippner, 1998).
7	Institutions playing their roles without political influence.
8	Involving line ministries in policy formulation.
9	Collective efforts towards sustainable NRM[i].
10	Consistent government will and financing of conservation and restoration programmes (Chazdon ,2008)
11	Coordinating at local and international levels.
12	Promoting regional and international cooperation in environmental decisions (Laszlo & Krippner, 1998).
13	Stakeholders sharing information.
14	Environmental education and empowerment at all community levels.
15	Communicating and respecting the mandate of environmental committees.
16	Effective environment impact assessment for projects (Mostert, 1996).
17	Networking with other environment related partners and the private sector.
18	Balancing between conservation and development.
19	Implementing forest management plans.
20	Forest Management Plans and systems restoring and conserving diverse species (Czech, Devers & Krausman, 2001; Pregernig, 2002).
21	Availability of affordable and accessible native and rare tree seedlings (Gann & Lamb 2006).
22	Government assigning designated extractive reserves.
23	Enforcing appropriate rules and sanctions.
24	Having a mixture of conservation strategies (Porter-Bolland et al., 2012, Ostrom, 1990).

25	Presence of national covenances for 'living collections', of threatened forest tree species (Pritchard et al., 2014, p.2).
26	Reduced distance to collect firewood to < 2 km.
27	Equitable use and conservation of natural resources.
28	Making relevant stakeholders fully aware of the full range of possible alternatives, opportunities, costs and benefits offered by restoration (Gann & Lamb, 2006).
29	Involving women in restoration and conservation programmes (Israel, 2007, Namanji et al., 2016).
30	Making environment polluters, degraders and abusers to serve their penalties.
31	Involving communities in forest policing.
32	Presence of forest management plans
33	Promoting international cooperation between Uganda and neighbouring states in environmental decisions
34	Facilitating communities to implementing the NEMP (Chazdon, 2008).

We organized the potential key indicators into a draft checklist at specific policy phases (Tables 2-5, pending testing for their practical use in monitoring effectiveness of the NEMP process.

To validate the potential list of indicators in the draft checklist, we applied the four-phase process to check each indicator (Castillo-Montoya, 2016). The four phases included 1) ensuring that each indicator aligned with a policy phase, 2) constructing an inquiry-based conversation, 3) receiving feedback on the interview instrument, and 4) piloting the interview instrument (ibid.). To ensure that indicators to be included aligned with policy phases, we created an assessment protocol matrix similar to Castillo-Montoya (2016), in which we organized all potential indicators into specific policy phases. We identified a wide range of indicators because we wanted to construct an inquiry-based conversation (ibid.).

After phase 1 and 2 above, we sought feedback to enhance the reliability and trustworthiness of the interview instrument. Feedback was through careful reading by research team members who checked on which indicator best fit with each systems principle, and whether each indicator was understandable and clearly related to the designated policy phase. To test whether indicators were adequately clear, Merriam (2009), we piloted the interview instrument with a sample of 10 people randomly selected from the same population as those with whom the research was to be conducted (Castillo-Montoya, 2016). After the four phases, we next tested the reliability and validity of the instrument by calculating the Content Validity Ratio (CVR) for each item (Lawshe, 1975).

CONTENT VALIDITY AND RELIABILITY TESTS

To develop and further fine-tune the instrument, basing on Genter et al. (2008), we categorized checklist indicators into 5 groups aligning with systems thinking principles. The second step of the soft systems methodology involved applying a purposive choice sample of thirty key Ugandans, including civil society actors, forest managers and policy makers. These determined the relative weighting of each of the thirty-four indicators in the potential assessment checklist in tables 2-5 (Taherdoost, 2016). Similar to Wallis et al. (2017), we considered all the potential indicators as important and maintained them at this stage. After identifying the experts, we sent them the proposed instrument as a content validity questionnaire, with each item on the questionnaire assessed using a three-point scale including 'not necessary', 'useful but not necessary', and 'essential' (ibid.), and calculated the CVR for each item, given by:

$$CVR = \frac{n_e - (N/2)}{N/2} \qquad (i)$$

where: CVR=Content Validity Ratio

ne=number of panel members indicating 'essential'

N=Total number of panel members (Lawshe, 1975)

The minimum value of CVR is 0.05 so we eliminated all items not found significant at that critical level.

We further tested for consistency of this checklist by calculating the Cronbach Alpha coefficient (Straub, Boudreau, and Gefen, 2004). The checklist was considered consistent and reliable with results equal to or above 0.60 (ibid.). The reverse was true if the Cronbach Alpha was below 0.60.

Cronbach Alpha is given by:

$$\alpha = [N/N - 1]\left[\frac{\int_x^2 - \Sigma \int_i^2}{\int_x^2}\right]$$

where N= Number of items in the instrument

$\int_i^2$ = Variance of individual item score

$\int_x^2$ =sum of variances of scores of individual items

$\int_x^2$ = variance of the total test scores

Results of the CVR and Cronbach Alpha enabled us to form a checklist for monitoring the NEMP process. Thus, indicators found with a CVR equal to or greater than 0.05 were further considered for the decision matrix. We selected only those indicators with the highest CVR in each phase, and then referred back to Tables 2,3,4, and 5 and picked out the respective policy phases for those high scored indicators. The consistent and reliable checklist was subjected to validation by key informants (step three of the soft systems methodology).

We purposively sampled 10 key informants who were directly responsible for policy within line sectoral ministries. This was because we recognized their importance in the national decision-making process as indicated by Marshall (1996), and aimed at inclusive consideration of varied social and political interests (step three above). Involving them at this point was a conscious attempt to not only fine-tune the instrument, but also build ownership in the process with people who would use the checklist for future policy development. We asked the 10 key respondents to rate each indicator on the list provided, using a Likert scale from one [least important] to five [most important], in order to identify the highest priority indicators for evaluating policy in each of the four phases. From the weighted indicators, we selected only those indicators above 50% of the overall score which we used to develop amoeba diagrams in Excel. Furthermore, we used these indicators to design the checklist for future monitoring of the NEMP process, and a model for assessing the current NEMP in Uganda.

Figure 3 summarizes methodological steps described in this section
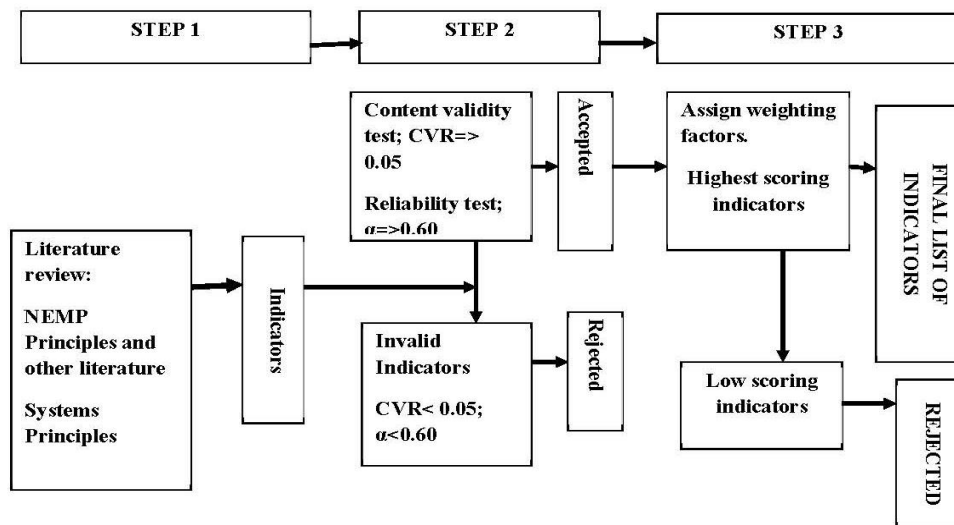

Figure 3. Methodological roadmap to the final list of indicators in table 6

RESULTS AND DISCUSSION

We present and discuss the results in four sections including indicators identified for evaluation, validity and reliability of the instrument, priority indicators at every policy stage and the proposed monitoring checklist.

Indicators identified for evaluation

Within each phase of the policy process, secondary data indicated five systems thinking principles including coordination, representation, collaboration, participation and teamwork. All of these principles were found advantageous to the success and sustainability of a system, as well as to the effectiveness of the policy process.

Tables 2-5 show specific policy phases indicating respective systems thinking principle, whether NEMP followed the systems principle, consequences of application or lack of application of the systems principle and potential success indicators identified

Table 2. Phase 1-The policy formulation process

Systems thinking principle	Did NEMP[ii] follow systems principle shown?	Consequences of application or lack of application	Potential success Indicators (s/n; in table 1)
Coordination	Yes	Formulating monitoring committees; Initiating NEMA (2006) policy process with new strategies.	1
	No	Inadequate capacity, limited facilitation, disruption of environmental activities, (Namanji et al., 2016).	2
	No	Duplicating forest management roles and wasting resources (Rep. of Uganda, 1995).	3
Representation	No	Poor participation based on regional distribution (Namanji et al., 2016).	4
	No	Misplaced initiatives that lack factual data basis (NEMA, 2017).	5
Collaboration	No	Mismanaging resources due to poor information flow among agencies.	6
Participation	No	Private sector and civil society organizations had limited freedom of action to influence policy design (Uganda Journalists Resource Centre, 2017). Consequently, the lack of systemic approaches to sustainability (Barile et al., 2018).	7
	Yes	Setting robust environmental principles (Rep. of Uganda, 1995).	8
Teamwork	Yes	Robust NRM policy (Namanji et al., 2016).	9

Table 3. Phase 2- The Policy communication process

Systems thinking principle	Did NEMP follow system principle shown?	Consequences of application or lack of application	Potential success indicators
Coordination	Yes	Initiating NEMA (2006) policy process with new strategies.	1
	No	Inadequate capacity and disruption of environmental activities (Namanji et al., 2016), leading to unsustainable systems. Limited coordination between environmental sector, political economic groups (ibid.).	34
	No	Overlapping roles; wasteful forest management by agencies (Rep. of Uganda, 1995), compromising the sustainability principle.	3
	Yes	Established policies in line with local statutes international conventions, for example Rio Conference (1992).	11
Representation	No	Limited awareness of stakeholders on environmental issues (Personal observation)	4
Collaboration	No	No discourse and agreements hence limited access to funding.	12
	No	Inadequate knowledge and use of policy guidelines.	13
Participation	No	Limited awareness and commitment to implementing the NEMP (Namanji et al., 2016). Lack of grassroots participation and disrespecting environmental laws (ibid.)-thus disregarding systemic approaches to sustainability (Barile et al., 2018).	14
Teamwork	No	Ignorance of environmental committees on their authority to sanction environmental polluters and abusers (Namanji et al., 2017).	15

Table 4. Phase 3- The policy implementation process

Systems thinking principle	Did NEMP follow system principle shown?	Consequences of application or lack of application	Potential success indicators
Coordination	No	Drastic environmental damage and disruption of social order due to Environmental Impact Assessment (EIA) data limitations. Poor monitoring of activities due to misplacing the EIA oversight role to National Environmental Management Authority (NEMA), but leaving implementation to relevant line ministries and departments, uncoordinated and conflicting policy implementation (NEMA, 2017; Rep. of Uganda, 1995).	16
Representation	No	Failure to sanction those violating the NEMP; because environment committees do not exercise their mandate to implement the policy (Namanji et al., 2017).	4
Collaboration	Yes	Environmental sector working with other institutions such as the National Water and Sewerage Corporation, National Forestry Authority(NFA), NEMA, Meteorological Authority, local government, civil society, development partners, etc. important for shared roles and responsibilities (Rep. of Uganda, 2015b), as well as for sustainable systems.	17
	No	Inadequate policy implementation due to corruption (NEMA, 2014).	7
Participation	No	Inadequate facilitation of District and local environment committees to implement the policy (Namanji et al., 2017, NEMA, 2010; 2011; 2013; 2014; 2017)	34
Teamwork	No	Environment committees ignorant of their authority to sanction environmental polluters and abusers (Namanji et al., 2017).	9

Table 5. Phase 4- The Policy operationalization process

Systems thinking principle	Did NEMP follow system principle shown?	Consequences of application or lack of application	Potential success indicator
Coordination	No	Restoration and conservation programmes not empowering local people; due to a minimal budget towards environmental sector (NEMA 2014; Rep. of Uganda, 2018), thus promoting weak sustainability.	10
	No	Unsustainable development programmes, because of Uganda's ambitious infrastructure development plan in its quest to become a middle income country by 2040 (Rep. of Uganda, 2015a); weak sustainability.	18
	No	Unsustainable forest management systems, with some forest management plans remaining on the shelf (Namanji et al., 2019).	19
	No	Inadequate functioning of the ecosystem, ecosystem goods and services, and limited DBH>50cm due to deforestation and restoration of single species plantings (FOEI 2013, Namanji et al., 2019, Nangayi, 2016);rendering unsustainable systems.	20
	No	Limited restoration of a fully functioning ecosystem, evidenced by limited tree nurseries and technical support to foresters (NEMA, 2014; Namanji et al., 2017).	21
	Yes	Communities' access to forest goods and services, for example, in Towa in Kalangala district (personal observation); Ecosystem services definition of sustainability.	22
	No	Ineffective monitoring of forest reserves (NEMA 2014) due to corruption. Forest structure lost due to degradation of forests (NEMA 2014, 2015, 2017); and increased illegal activities due to weak monitoring of resources (NEMA, 2014).	23

	No	Deprived communities of a wide range of benefits. (FOEI, 2013; Nangayi, 2016; NEMA, 2017); Ecosystem services definition of sustainability.	24
	No	Loss of germplasm or threatened forest trees (NEMA, 2016/2017).	25
	No	Heavy dependence on fuel wood; enhancing deforestation (NEMA, 2014) 93% of primary energy demand is from biomass (Frankel-Reed, Frode-Thierfelder & Porsche, 2011).	26
Representation	No	The powerful elites overharvest forest resources to the disadvantage of the majority of community members (FOEI, 2013; Nangayi, 2016). This is probably due to neglecting a systemic approach to sustainability	27
	No	Limited restoration and conservation due to non-involvement of communities in those respective activities (Namanji et al., 2019).	4
Collaboration	No	Less collaboration at policy operationalisation, overlapping roles and responsibilities; and unclear streamlining of authority in the National Forestry Plan (Rep. of Uganda, 2013)	17
	No	Inadequate use of policy guidelines, since policies are side-lined by local political influence and international institutions (Downie, 2013; Hicky, 2012).	7
	No	No education on the NEMP principles, thus causing a continuing inadequate knowledge about the policy in the field, even if people in general perceived policy practices as useful (Personal observation).	28
Participation	No	Continuing high rate of environmental damage (NEMA, 2017).	29
	No	Less community commitment to environmental protection, policing and conservation activities, thus more environmental damage	14
Teamwork	No	Continuing overharvesting, and thus forest degradation (NEMA, 2017).	29
	No	High level of corruption causing more environmental damage.	30

Based on results presented in Tables 2-5, ignoring systems thinking principles in environmental management could potentially contribute to natural resource degradation and failure to achieve sustainability and sustainable development. Thus, we accept the hypothesis that applying systems thinking principles during all phases of the policy process has potential for providing a rational basis for choosing appropriate measures to evaluate environmental policy success. An effective NEMP process would have a multiplicity of characteristics which may serve as indicators for natural forest tree biodiversity conservation. To develop those identified indicators into a checklist, we subjected them to content validity and reliability tests.

Validity and reliability of the instrument

Results of the content validity and reliability tests gave a Cronbach Alpha coefficient of α= 0.62,

where $\alpha = \left[N/N-1 \right]$; N=34; $\int_x^2 =; 18.06, \ and \ \int_i^2 = 7.22,$ which showed that the instrument was valid,

reliable and therefore consistent.

Priority indicators at every policy stage

At policy formulation, our results show indicators 8 and 4 (Table 1) as the most important (Figure 4). Indicator 1 and 2 are equally important with equal weight as shown in Figure 4.
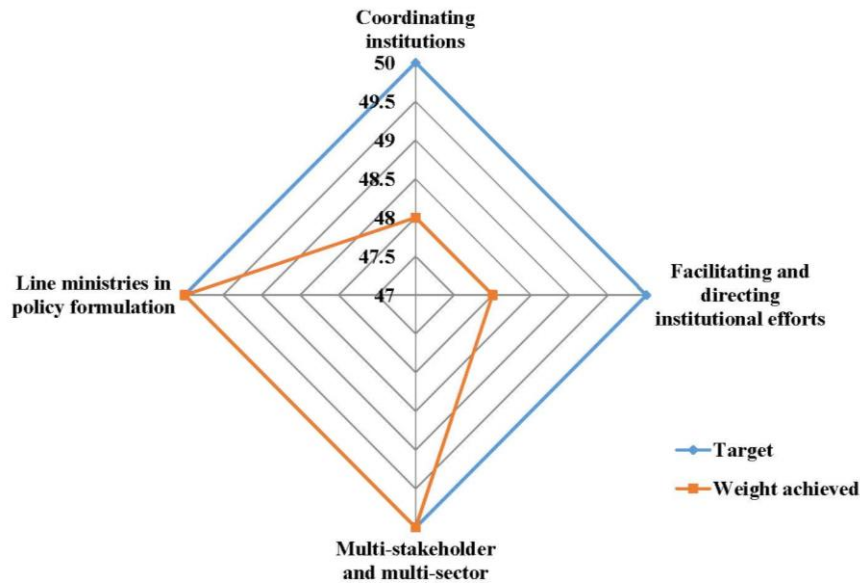

Figure 4. Monitoring indicators with respective weight at phase 1-Policy formulation

This finding concurs with reports of previous literature like Namanji et al. (2016), who established that during the environment policy formulation in 1995, the policy document showed that the Ugandan government involved relevant ministries hence applying multi-stakeholder and multi-sectoral approaches showing characteristics of the systems thinking principle of coordination. Embracing multi-sectoral interactions among social, political, ecological

and economic issues helps in the improvement of networking among different sectors on important crosscutting issues, ICSU (2010), Wolf (2011) and effective working relationships (Arkesteijn, Mierlo, & Leeuwis, 2015). This implies a policy process aligned with systems thinking which in turn promotes sustainable development. Eksvärd (2009, p. 9), reported that 'A practical implementation of sustainable development has to incorporate the inherent conflict between the values, ambitions and goals of a multitude of stakeholders'. Accordingly, solving complex environmental problems to achieve sustainable development requires complex political-economic processes free of unequal power relations (Bryant & Bailey, 1997). However, multi-stakeholder and multi-sectoral involvement requires adequate facilitation, though findings in NEMA (2000; 2006; 2008; 2010; 2014) highlight inadequate financial facilitation of the policy process.

At the policy communication phase, respondents found indicator 3 and 4 as most important, followed by indicator 1 and 14 (Table 1 and figure 5).
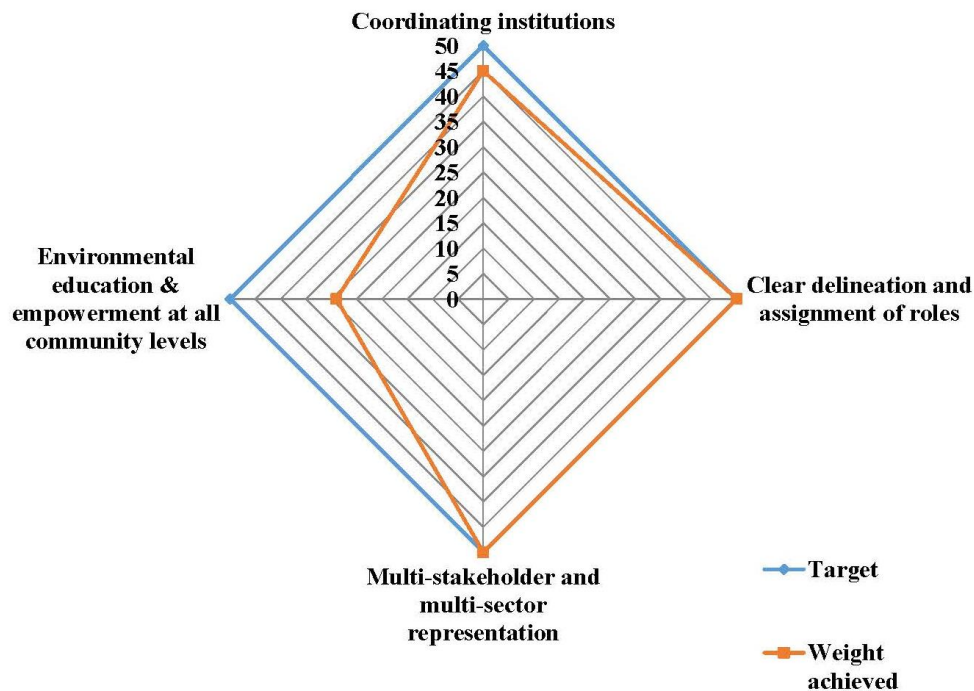

Figure 5. Monitoring indicators with respective weight at phase 2- policy communication

We note in this study that much as the Uganda government established institutions for proper formulation of the environmental policy, this was inadequate without educating, assigning roles, clearly streamlining authority thus overlapping roles and responsibilities (Rep. of Uganda 1995; 2013), and facilitating the people and the process. Failing to facilitate and direct effective, well-coordinated institutional efforts, as presented by NEMA (2000; 2006; 2008; 2010; 2014) and Saith (2006) relating to Millenium Development Goals (MDGs) failure, as well as failing to clearly delineate and assign appropriate roles to collaborators, caused negative consequences of inadequate capacity and

disruption of environmental activities Namanji et al. (2016), and the system as a whole. Furthermore, the Sustainable Development Goal (SDG) 16 recommends building effective, accountable and inclusive institutions at all levels as exhibited in our finding, and as articulated in the Sustainable Development agenda 2030.

At implementation, results showed that respondents found indicator 4, 9 and 10 as most important, followed by indicator 16 and 34 (Table 1 and Figure 6). At this level, indicator 17 scored lower, although it remains an important aspect.
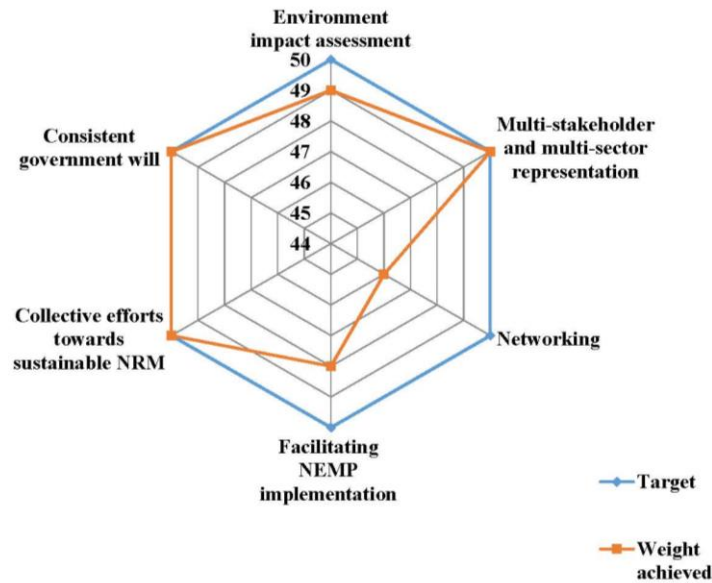

Figure 6. Monitoring indicators with respective weight at phase 3- Policy implementation

According to the International Council for Science (ICSU) (2010) and Wolf (2011), within the systems thinking perspective, multi-sectoral involvement and interaction could improve networking among environment related partners. Berkes and Folke (1998) and Sachs (2012), reported that government will and financing of conservation efforts would succeed with a strong institutional setting thus forming the foundation for successful implementation of development policies and programs. Mostert (1996) valued environment impact assessment of programmes. Our literature survey showed inadequate application of systems thinking principles in policy implementation which was due to lack of representation in the applied participatory approach (Namanji et al., 2016). A facilitated multi-stakeholder centre at the village level, Ssekyewa and Namanji (2014), would probably ensure a more effective policy implementation process, in which participants from various disciplines together set natural resource management rules and modify them over time (Ginnis, Michael & Ostrom, 1992). Since this process ensures inclusiveness, it promotes sustainable systems and thus sustainable development.

Furthermore, the Ugandan state of environment reports by NEMA (2000; 2006; 2008; 2010; 2014) and other literature including Bazaara (2003), Hartter and Ryan (2009), Nelson and Agrawal (2008) reported giving financial priority to social services other than to environmental conservation, thus promoting weak sustainability. It should be noted that

achieving strong sustainability requires the balance between social, economic and environmental spheres (Wu, 2013). Thus promoting social sustainability, economic sustainability and environmental sustainability (Barile et al., 2018). Giving priority to social services may have been fostered by the absence of a mechanism to ensure coordination of sectoral and local authority agencies' responsibilities as well as activities hence reflecting an institutional failure (Apostolopoulou & Pantis 2010; Engel & Palmer ,2011). This implies that a systems thinking principle of coordination was neglected due to lack of ingenuity in designing partnerships between central and local governments.

At policy operationalisation, results showed that indicator 10, 23 and 14 reached the target score of 50 and thus were considered extremely important indicators of an effective policy operationalization (Table 1 and Figure 7). Indicator 27 scored lowest (41) at this stage.
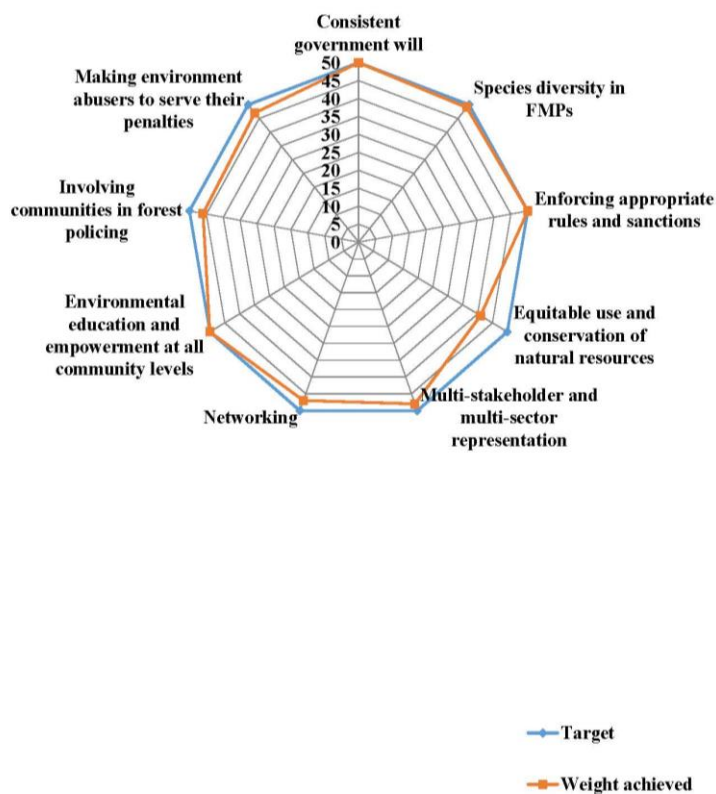

Figure 7. Monitoring indicators with respective weight at phase 4- Policy operationalization

Elsewhere, Chazdon (2008) showed that it is important for governments to finance conservation and restoration efforts. One of the paths to sustainability is through the ability of financial systems to deliver ecosystem services required for the well-being of the people (Wu, 2013). Gallopin (2003) argues that among the determinants of sustainability is the availability of resources and empowerment. However, in Uganda there was little government will to avail financial resources for financing environmental activities (NEMA, 2014; Rep. of Uganda, 2018). There are gaps in other important indicators identified at this stage including failure to enforce appropriate rules and sanctions NEMA (2014; 2015; 2017), as well as inadequate environmental education and awareness (Namanji et al., 2016;

2017). Furthermore, Nunan, Campbell and Foster (2012, p. 266) argue that 'policy objectives are only achieved if a wide range of separate ministries or agencies incorporate and implement them'. Therefore, policy processes would ideally engage multi-stakeholder and multi-sector representation and inclusive growth as depicted in the sustainable development goals. In addition, preservation of biological diversity is best achieved with government efforts on respecting multiple use protected areas (Nelson and Chomitz, 2011). When local people have an intuitive understanding of environmental crosscutting issues, community managed forests have potential to improve livelihoods for decades (ibid). It is important to respect the views of local communities in land use planning and biodiversity conservation because these favour local priorities (Padmanaba and Sheil, 2007).

Thus, results at all policy phases of planning, communication, implementation and operationalization show that identified characteristics of systems thinking principles are also key indicators of an effective NEMP process. For instance, indicator 4 is an important component at all phases of the policy process and is a characteristic of all the five systems thinking principles of *teamwork, collaboration, participation, coordination and representation.* In reality, NEMP processes that do not embrace systems thinking through multi-sectoral representation are often based on *'individualism'* and '*competition* (Laszlo and Krippner 1998, Chap. 3, p. 11-12) and do not promote sustainable systems. This is because, a systems perspective can potentially contribute to sustainability and sustainable development (Gallopin, 2003). This implies that systems thinking can be part of a rigorous process towards achieving environmental goals, reason that our results in Tables 2-5show that wherever there was absence of systems thinking, there were negative impacts on the environment even though government institutions existed.

Based on identified indicators, we developed a tool for monitoring the success of the NEMP process. The tool could provide a viable model for other countries that continue to experience loss of forests in spite of legislation and set rules, but not enforced. We organized these indicators in respective policy phases, and prioritized them into a tool to monitor the quality of a NEMP process.

Tool for monitoring the environmental policy process

To develop the above tool, indicators prioritized according to respective weights were summarized in a checklist (Table 6). This checklist indicates that a conserved sustainable ecosystem is attained through continuous application of key systems thinking principles embedded within the indicators at each policy phase. These are indicators for assessing the effectiveness of a NEMP process (Table 6). We further present this table as a model for assessing the current NEMP in Uganda.

Table 6. Final list of indicators for scoring success of policy formulation, communication, implementation and operationalization

Policy Phase	Indicator S/N	Score (1-5)	Reason for score
Formulation	1	4	Formulating monitoring committees; Initiating NEMA (2006) policy process with new strategies.
	2	2	Inadequate capacity and disruption of environmental activities (Namanji et al., 2016).
	3	2	Duplicating forest management roles and wasting resources (Rep. of Uganda, 1995)
	4	3	Limited awareness of stakeholders on environmental issues.
	8	4	Setting robust environmental principles (Rep. of Uganda, 1995).
Communication	1	3	Initiating NEMA (2006) policy process with new strategies.
	3	2	Overlapping roles; wasteful forest management by agencies (Rep. of Uganda, 1995)
	4	2	Limited awareness of stakeholders on environmental issues
	14	2	Limited awareness and commitment to implementing the NEMP (Namanji et al., 2016). Lack of grassroots participation and disrespect of environmental laws (ibid).
Implementation	4	2	Failure to sanction those violating the NEMP; because environment committees do not exercise their mandate to implement the policy (Namanji et al., 2017).
	9	2	Ignorance of environmental committees on their authority to sanction environmental polluters and abusers (Namanji et al., 2017).
	34	2	Inadequate facilitation of District and local environment committees to implement the policy (Namanji et al., 2017; NEMA, 2010, 2011, 2013, 2014, 2018)
	16	2	Drastic environmental damage and disruption of social order due to EIA data limitations. Poor monitoring of activities due to misplacing the Environmental Impact Assessments (EIA) oversight role to NEMA, but leaving implementation to relevant line ministries and departments (Rep. of Uganda, 1995).

	17	4	Environmental sector working with other institutions such as the National Water and Sewerage Corporation, National Forestry Authority (NFA), NEMA, Meteorological Authority, local government, civil society, development partners, etc. important for shared roles and responsibilities Rep. of Uganda (2015b).
Operationalization	4	3	Limited restoration and conservation due to not involving communities in those respective activities (Namanji et al., 2017).
	10	2	Restoration and conservation programmes not empowering local people; because there is a minimal budget towards environmental sector (NEMA 2014); 3% of the total National budget is allocated to the water and environment sectors (Budget speech 2018/19).
	14	2	Less community commitment to environmental protection, policing and conservation activities, thus more environmental damage.
	17	3	Less collaboration at policy operationalisation, overlapping roles and responsibilities; and no clear streamlining of authority. (National Forestry Policy, 2001).
	20	2	Inadequate functioning of the ecosystem, ecosystem goods and services, and limited DBH>50cm due to deforestation and restoration of single species plantings (FOEI, 2013; Namanji et al., 2017; Nangayi, 2016)
	23	2	Ineffective monitoring of forest reserves (NEMA, 2014) due to corruption. Forest structure lost due to degradation of forests (NEMA, 2014, 2015, 2017); and increased illegal activities due to weak monitoring of resources (NEMA, 2014).
	30	2	High level of corruption causing more environmental damage.
	31	1	Continuing overharvesting, thus forest degradation (NEMA, 2017, 2018).
	27	2	Overharvesting of forest resources by the powerful elites, to the disadvantage of the majority of community members (FOEI, 2013; Nangayi, 2016).

Note: At a score of 1-5,
1=1-20%, No implementation;
2=21-40%, Poor implementation;
3=41-60%, Fair implementation;
4=61-80%, Good implementation;
5=81-100%, Excellent implementation
Scale proposed by the key informants. This also serves as a model for assessing the current NEMP in Uganda

CONCLUSIONS AND RECOMMENDATIONS

For our selected case of Uganda, the Environmental Policy Management Act was enacted in 1995, and experienced a number of process limitations. Presence of rapid assessment tools with systems thinking derived indicators to monitor the effectiveness of the environment policy process would prevent further environment degradation and promote sustainable systems as well as sustainable development. Therefore, we conclude that:

- Involving all relevant line ministries and engaging multi-stakeholder and multi-sector group representation is a priority indicator of environment policy process effectiveness. This is due to the importance of a viable systems approach, that promotes interaction of multiple stakeholders as an essential aspect for a sustainable equilibrium (Barile et al., 2018).

- Delineating and assigning roles, having effective institutions in place and creating environmental education, awareness, and empowerment at all community levels, are important indicators of an effective environment policy communication process.

- Engaging multi-stakeholder and multi-sector group representation, collective efforts towards sustainable Natural Resource Management, consistent government will and financing of conservation and restoration programmes, environment impact assessment for projects, and facilitating communities to implement NEMP should be prioritized as indicators of effective environment policy implementation.

- Government will, financial facilitation of environment programmes, enforcing appropriate rules and sanctions and providing environmental education and awareness at all community levels are key indicators of effective operationalization of the environment policy.

- In Uganda effective operationalization of the NEMP was lacking.

- Whereas our checklist is based on Uganda's current NEMP, it could be adapted and applied to other governments' environmental policy process situations.

We therefore recommend;

- Systems thinking during policy formulation, communication, implementation and operationalisation as a priority through promoting,
    - (1) Institutional capacity and resources for environmental planning and regulation;
    - (2) Sectoral involvement and interactions;
    - (3) Collaborative governance;
    - (4) Multi-stakeholder centres at village level;
    - (5) Community awareness; and
    - (6) Collective efforts towards sustainable natural resource management.
- The use of the developed checklist to prevent environmental loss and promote sustainable systems. These can be achieved by providing measurement of success of an environmental policy process.

- Implementation of field research to test the feasibility of applying our checklist and model to other environment policy process situations.

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NOTES:

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[i] Natural Resource Management

[ii] National Environment Management Policy