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Conference Concept Paper:

Perspective of Islamic Thought Application on Integrated Ecosystem Service Management Symbolized on Water as Indonesian-Malaysian Approach *via* Subsidiarity with Environmental Education and Scientific Research

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Abstract: Islamic thought and concept of ecosystem level biology are combined in order to develop a perspective of Indonesian-Malaysian approach for integrated water and water environmental management. The objective of this review research is focused to state the significant potential of subsidiarity in environmental education with scientific research, integrated environmental management program for sustainable water and water environment. According to review, the responsibility of Ecosystem Service Management (ESM) of river and costal zone is historically trusted to the government by regional people, which academically states public trust doctrine, and the government is not often aware that they are historically trusted the right of ESM from regional people. On the other hand, water environmental matter is formally isolated from environmental right and human's fundamental right in jurisprudence and its applications. By this situation, governments have a problem in environmental policy making and its implementation, and environmental decision making for regional development. Thereby, public participation is expected from governmental viewpoint. In order to resolve the gap by this situation, it needs to be stated that environmental education has significant potential. Thus, multilevel individualism is considered for environmental education. On the other hand, water and water management issue is considered from *Sufism* in Islamic thought. The concept of multilayer individualism has been realized in the relationship between God and an individual in the thought, and there was no contradiction with each other. Thus, it is considered that potential environmental educational programs based on these concepts of multilevel individualism and *Sufism* have ability to improve integrated ESM, and strategic environmental assessment *via* development of citizen scientists, who are well-informed persons and simultaneously have potential to participate in environmental service management. The subsidiarity from environmental education with scientific research and Islamic thought in integrated ESM has the potential to promote the actual feasible practice of sustainable development for water and water environment. This paper was consisted *via* open collaboration, so the interest was stated in bibliographical introduction.

Keywords: *Ecosystem level biology, Integrated coastal and watershed management, Multilayer individualism, Public participatory approach, Regional branding*

1. Introduction

1.1. Scope

A person's unique life is a part of the world, and all informed person's lives are organized with other individuals and also the recidual properties of the world. The outlook on the world, which all in one and one in all is the notion of multi level individualism. It is not for only mankind, as any living organism enjoys life's interactions within themselves or loosely organized with environment. Systems at this level are named ecosystem, for this reason ecology is ecosystem level biology (Margaleff 1968). Ramon Margaleff has clearly stated the perspective, moreover he stated ecosystem is civilization heritage for mankind, and he guessed that circumstance of cooperation and increase of the spirits to leave civilization heritage will leave the world in future (Margaleff 1972).

In the period of four decades, the approach for ecosystem management has been becoming systematic through many case works, and useful guidelines are also rapidly becoming available. Currently, precautionary principle (Cameron and Abouchar 1991, Kriebel *et al.* 2001) is the most considerable higher technical principle for the operative environmental management planning. In this

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context, ecosystem approach (Kaya *et al*. 1999, CBD 2000) is the credible strategy to implement integrated ecosystem approach in regional environmental management policy making (*e.g.* RCOW 1999). Thereby capacity of environmental monitoring is the basis for conventional environmental surveillance, and environmental impact assessment (Glasson *et al.*1994) which are current general destination (level 1 in Fig. 1). However, it is being realized these social system shown as level 1 in Fig. 1 has limitations. The strategic environmental assessment (Gauthier *et al*. 2011) and integrated environmental management (*e.g.* RCOW 1999) are the next expected paradigm as shown level 2 in Fig. 2.

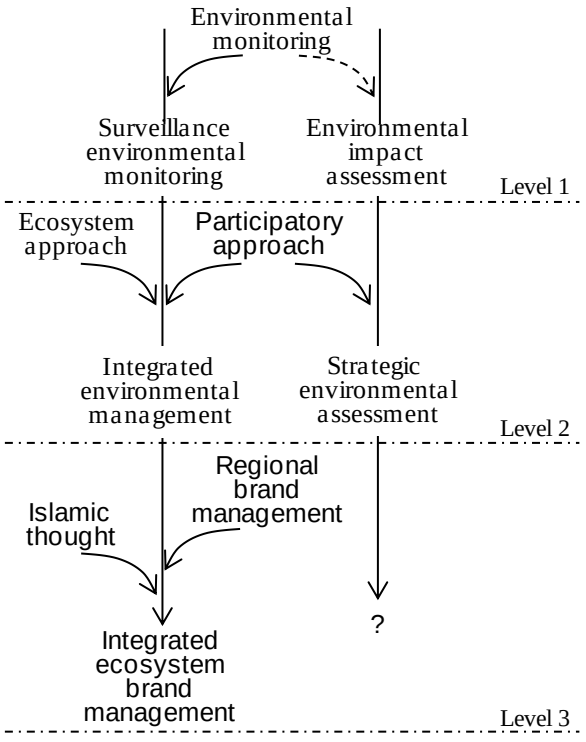

Fig. 1. A schematic depiction of environmental management perspective. Currently, public participation is understood as promised approach to mature integrated environmental management and strategic environmental assessment. In this research, regional brand management, in addition as Indonesian-Malaysian approach, additional element of Islamic thought is considered.

In order to against the reflexive environmental problem of mankind, sustainable development has been significant theory since 1992 (UNCED 1992). In current environmental management framework in challenging that is level 2 in Fig. 1, what is eager has been informed public participation (Gauthier *et al.* 2011). Hence, it can be consequent that environmental education to develop citizen scientists (Miller 1993, Cronin 2010), who are well-informed persons and have potential to participate environmental management, is the key issue.

1.2. Objective

The objective of this review research was focused on to examine significant potential on environmental education that is subsidiary with environmental assessment, integrated environmental management program for sustainable water resource and water environment. By this context, we are proposing Islamic thought in order to develop perspective of Indonesian-Malaysian approach of participatory and integrated environmental management that is spatially applicable from coastal off shore to headwater basin. Thereby the theme is essentially very complex, and scale issue is also either from local to global and from person to society, so a keyword was assumed as regional brand management toward potential consequence of integrated ecosystem brand management (level 3 in Fig. 1) in order to make concept level framework focused and to make the concept feasible in potential actual action plans.

2. Perspective of Environmental Management

2.1. Sustainable Development in Eco-regionalism

In the perspective of ecosystem level biology, an ecosystem is defined as a complex of regional land systems that each sub-property of land attributes respectively consist particular ecological units with unique biological communities in total. Mankind has lived in favor of ecosystem services from regionally unique ecosystems and cultural life of mankind have also been retained by interdependability with different types of unique regional ecosystems (Naveh and Lieberman 1993). Though, modern economy has been developing in dissociation from such ecological regionalism. The isolation has been resolved spatial economical restriction from ecological regionalism, and it has been realizing its unlimited growth. As a result, increased performance of global economics is requiring more material and energy with less importance of ecological regionalism. On the other hand, regional environmental problems exist, since peoples still live with favor of regional services from domestic ecosystems, and also need to dispose excess energy, materials, and wastes to the ecosystems making environmental impact.

The services from regional ecosystem are defined from four aspects (Sarukhan and Alcamo 2003): i) Provision service is a potential product from regional ecosystem, such as, food, fresh clean water, and biological resources, ii) Regulation service is potential in stabilizing local climate, disease, hydrology, water quality, pollination, iii) Cultural service is non-physical benefit from local property of spirit, religion, recreation, aestheticism, inspiration, education, presence, and cultural heritage, and iv) Supporting service is fundamental to generate former three categories of services by soil formation, nutrient cycle, and primary production. The ecosystem services are provided ether from complete natural environment and also from regional secondary environment that mankind has changed for their own better circumstances. Therewith, the definitive point is the fact that only balanced (which may be defined as healthy in common sense) ecological system can provide certain environmental services

(Kaya *et al*. 1999, CBD 2000). The core issue of sustainable development is to sustain ecosystem services that can be realized by an inter-dependent sound arrangement between development and performances of ecosystem services. In this sense, environmental resource management is achieved *via* management of provision and regulation services basis with supporting service, where as cultural services are required to achieve environmental commitment.

2.2. Precautionary Principle

Regional ecosystems are highly complex properties, for that reason. It is mostly impossible to collect complete information, while at the same time facing conflicting pressures from those who seek to balanced economic growth and environmental protection. In the circumstance, precautionary principle has a role to create positive redundancy and flexibility in decision making process that secures opportunities to think differently among stake holders (Cameron and Abouchar 1991, Kriebel *et al.* 2001). The precautionary principle takes significant role to bridge between science and social policy in environmental decision making process, as if environmental decision making processes are highly systemized and rigid, wise decisions will not be possible. The problem of impossibility to prepare complete alternative knowledge framework is subsidized by precautionary principle in environmental decision making process. Kriebel *et al.* (2001) has stated four central components of the functions of precautionary principle: i) taking preventive action in the face of uncertainty, ii) shifting the burden of proof to the proponents of an activity, iii) exploring a wide range of alternatives to possibly harmful actions, iv) and increasing public participation in decision making.

2.3. Ecosystem Approach

Integrated management of ecosystem service demands strategy to apply appropriate scientific methodologies that promotes to reach a balance among conservation, sustainable use, and the fair and equitable sharing of the benefits (Kaya *et al*. 1999, CBD 2000). Currently, a notable comprehensive guideline for ecosystem approach could be CBD (2000) in which the definition of ecosystem approach is: the priority target is on maintaining ecosystem services by conservation of ecosystem structure and functioning. Thereby all relevant sectors of society and scientific disciplines should be involved for the perspective, and the operational processes should be decentralized to the lowest appropriate level. In the acts, relevant information is very important, which include effective scientific and indigenous application and local knowledge, innovations, and effective practices. However, ecosystems are complex and have dynamic nature, and it needs to accept the absence of complete knowledge or understanding of their functioning. Moreover, in order to manage ecosystem services, the limits of their functioning should be considered (*e.g.* productivity, capacity of natural water purification rate, and *etc*.), the effects of their activities on adjacent and other ecosystems, and the appropriate spatial and temporal scales. The natural inevitable change of ecosystem should also be recognized, and long term set of management objectives are applied to characterize ecosystem processes with the varying temporal scales and lag-effects. According to these properties, the ecosystem approach requires adaptive management. Whilst, even when some cause-and-effect relationships are scientifically not yet fully established, environmental measurements need to be taken in research feedback. Containing elements of "learning-by-doing" in management practice, the potential gain from management is recognized in an economic context through the appropriate balance and integration between conservation and development, which is continuously managed. The basic principle of the ecosystem approach is the matter of social choice in ecosystem service management in such continuous adaptive processes. The definition can be summarized with the following key issues, to prepare comprehensive knowledge within ecosystems for social wise choice, and to use adaptive management practices in order to array out management actions with economic context at appropriate scale for the issue being addressed with decentralization to lowest level, and to enhance benefit-sharing. In the process, it needs to ensure intersectoral cooperation.

2.4. Environmental Assessment

Environmental Impact Assessment (EIA) has been the social tool to obtain environmental information to establish mutual consequence between regional development and natural conservation (Glasson *et al.* 1994). Though, after more than 30 years of EIA and related experiences in the world, it has been cleared that science on its own, without a process of consideration and dialogue amongst a wide range of stakeholders, cannot provide guidance on the 'best' options for a future action (Cash *et al*. 2003, Gauthier *et al.* 2011, McNie 2007, Timmerman *et al.* 2010, Tippett *et al.* 2007). This is still shocking outcome to a lot of scientists and specialists, as their traditional role have been technical experts as the main players and advisors to consider priority of options in environmental consultancy works. The improvement of this Communication Gap (CG) would be critical issue, as if EIA is enhanced without the improvement of CG, this activity will result in miserable outcomes, that is so called data-rich-but-information poor syndrome (McNie 2007, Mcnie *et al*. 2007, Timmerman *et al.* 2000; 2010, Ward *et al.* 1986) and the environmental policy implementation gap will occur repetitively. Thus, conventional EIA is being extended towards a new paradigm. According to several authors, environmental assessment is entering a postclassical rational planning phase (Fisher 2002, Lawrence 2000), *i.e.* it is time to link technical approaches to socio-political debates, increasingly prominent *via* multiple negotiations that are at the core of decision-making process (Gauthier *et al.* 2011). Strategic Environmental Assessment (SEA) is a challenge to overcome CG (Gauthier *et al*. 2011). For instance, public participation in SEA is in a process of implementation and has ability to influence public environmental awareness level (Gauthier *et al*. 2011).

From a viewpoint of decision making processes, environmental decision-making hierarchy is generally composed of four levels, such as Policy, Plan, Program

(PPPs) and Project (Fischer *et al.* 1999, Gauthier *et al*. 2011, and OEDC 2006). As one moves down the hierarchy from policies to project, the nature of decision-making changes where the process at higher PPPs level tends to deal with more flexible proposals with wider range of scenarios toward the broader goals (OECD 2006, Fischer *et al.* 1999; 2002). In nature, as improvement of CG demand to concern the criticism on social level problem, environmental assessment with decision-making processes at early PPPs level has been focused (Cash *et al.* 2003, Fischer *et al.* 1999, Guthier *et al.* 2011, McNie 2007, Timmerman *et al.* 2010) as there is the very state that familiar with precautionary principle (Cameron and Abouchar 1991, Kriebel *et al.* 2001). In fact, after decades of experience and related activities mainly through strategic EIA, the required solution is already recognized that is multiple dialogues amongst different level of socio-environmental actors (Gauthier *et al.* 2011, Graveline *et al.* 2010, DeStefano 2010, Letcher, Timmerman *et al.* 2010). Accordingly new challenging environmental assessment requires suitable actual tools and systems (Graveline *et al.* 2010, Kikuchi *et al.* 2010, Roig *et al.* 2007). Today the demand to aid early decision making process is a promised work to enhance social inter-institutional consultations in regional planning and development processes (Cash *et al.* 2003, McNie 2007, Timmerman *et al.* 2010).

2.5. Participatory Approach in Environmental Management

In a modern society, active, free, and meaningful participation is already assumed as system property in ecosystem approach for integrated environmental management program and environmental assessment. Public participation is a process that individuals, groups and organizations decide to take an active role in making decisions that affected them and allowing people to influence the outcome of plans and working processes (De Stefano 2010). Mouratiadou and Moran (2007) have stated that if stakeholders are not involved in the evaluation of environmental management policy measures, the decisions taken can be controversial and generate public opposition, thus making those decisions unfeasible. Such implementation gap is expected to be dissolved *via* public participation (Gauthier *et al*. 2011). The participatory management (collaborative management, co-management, joint management) is already a central device in diverse international administrative systems, such as, Convention on Biological Diversity (CBD), Ramsar Convention, The International Treaty on Plant Genetic Resources for Food and Agriculture, United Nations Framework Convention on Climate Change, United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD, International Tropical Timber Agreement (ITTA), Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, The Operational Guidelines for the Implementation of the World Heritage Convention, Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (The Aarhus Convention), C169 Indigenous and Tribal Peoples Convention, Chapter 32 of Agenda 21. Participatory environmental management process is obviously of the kernel for sustainable development.

Integrated management *via* participatory working principle is currently considered as the most promising approach for environmental management, for example, the substance has been summarized into eight points from experiences in Ramsar Convention (RCOW 1999): i) to help to decide upon the objectives of site management, ii) to identify and describe the management actions required to achieve the objectives, iii) to determine the factors that affect, or may affect, the various site features, iv) to define monitoring requirements for detecting changes in ecological character and for measuring the effectiveness of management, v) to demonstrate that management is effective and efficient; maintain continuity of effective management, vi) to resolve any conflicts of interest, vii) to obtain resources for management implementation; enable communication within and between sites, organizations and stakeholders, iix) to ensure compliance with local, national and international policies.

3. Regional Brand Management

3.1. IWM and Its Requirement from ICZM

The concept of sustainable development by participatory working principle has been realized in the natural resource management among river, lake, and coastal region, *via* movement of Integrated Watershed Management (IWM), and Integrated Coastal Area Management (ICAM) since 1980s, IWM and ICAM has been new approach for integrated environmental concern regional development, natural resource management, and nature conservation. Moreover, these were getting integrated as Integrated Watershed and Coastal Area Management (IWCAM) since 2000s.

The pith of ICZM is a desire to improve sectoral and fragmented management approach that potentially moderates inefficient or exploitive use of natural resources, conflicting claims in coastal zone. In order to promote sustainable management of coastal ecosystem service, a dynamic, multidisciplinary and iterative process is considered. ICZM seeks over the long-term, balanced environmental, economic, social, cultural, and recreational objectives. Hereby, as sea is downward element of contacting terrestrial landscape of watershed, the combination of the ICAM and IWM is targeted in IWCAM. The integration is being rather important if a big river or highly human impacted river connected to enclosed or semi-enclosed sea. In the definition, for example, IWCAM could be important for Johor strait and rivers in and around Johor urban area *i.e*. Iskandar area, as well as Madura strait and Brantas river watershed *i.e*. Sura-Madura-Bromo Tengger Semeru area.

In general, spatially input regional precipitations gradually converge during flow through the watershed toward lower landscape. In the process, during water flow, the moving water interacts with physical, chemical, biological, and anthropogenic landscape properties along the flow paths at each upper landscape. The changes not only occur in the water flax regime, but also in water quality. Obviously, in

order to manage a particular water body as water resource, the origin of the water must be considered, *i.e.* management of the upstream landscape is compulsory by holistic approach. By the definition, "Watershed management" is one of the ultimate management goals in terrestrial water resource conservation. Moreover, it contributes to an all balanced ecosystem service management in the watershed and it potentially contributes to downstream of coastal area management too.

3.2. Regional Ecosystem Brand Management

Informed public participation is understood as very effective approach for integrated environmental management. The volunteer participation for the aspect is still quite challenging theme even the activity is purposeful for social wealth. In many cases, the notion "Integrated" clearly indicates that resources management should be approached from a broad perspective taking all potential trade-offs and unique scales in space and time into account where different goals are in conflict (Pahl-Wostl 2008). The actual framework for IWM, ICAM, and IWCAM are different for particular regional, social, economical, and ecosystem setting. Thereby, it is sometimes difficult to understand the pith of framework because of the complexity. However if a viewpoint of "regional ecosystem brand management" is focused, the pith of the movement may simply be understood. Based on the assumption, there is no restriction to whether an integrated management is for coastal, watershed, and these combination, so from herewith, a synonym, Ecosystem Service Management (ESM) is used for all IWM, ICAM, and IWCAM. By this context, a simple explanation will be a framework of adaptive improvement of sustainability for human and social capacity development in environmental context: i) it conserves fragile natural resource, ii) it improves low rate of economic growth, iii) it increase weakness of institutional capacity, iv) it encourage public expectations for environmental sustainability, v) it internalizes regional value to local people, vi) it makes the regional values, regional identity and brand externalized.

In the sense, the goal of ESM will be autonomous externalization of values from regional properties and its identity from individual-level-value-internalization, which offers social choices in public expectation of balanced economic growth and conservation of fragile natural resource that consequently sustain regional environmental wealth and quality of life. It expresses a fact that the goal of ESM is the regional ecosystem brand management by multilevel governance, as it is possible when all people have extended individualism to the regional ecosystem brand and government has commitment to support it.

3.3. Scientific Research for ESM

ESM need to be scientific information base wise communication. Scientific research and scientific based environmental impact assessment are to be fundamental part of the activity for integrated environmental management program. However, in order to promote sustainable management of river and coastal zone, it does not need to cover the full cycle of information collection for planning, decision making, and management and monitoring of implementation. What is clearly addressed is application of on demand scientific information, and long term and shallow but wide monitoring activities. Scientist must know research that support ESM are to be prepared to solve reverse problems after actual problems are stated by problem profiling.

Research topics that are to solve reverse problem stated from actual water and watershed situation may contain diverse topics. For example, water quantities, nutrient transformation, sediment flux, habitat composition for aquatic biota are basic property of stream. Multi layer structure of river, function of wetland and flood plain, ecological and social impact of dam construction, and those of management perspective are ecosystem level river property. Hydrology of paddy field, hydrogeomorphology of slope cultivation, cultural landscape, traditional environmental concerns, forest, and grassland management practices are ecosystem level land use property of a watershed. Simulation modelsm for water balance, flood, nutrient cycle and sediment budget are also effective if appropriate database is available. For the estuary, there occurs complicated nutrient adsorptions and desorptions process, and organic material segregation, biochemical-physical process occurs in an around mangrove ecosystem.

As origin of food web in regional biota, biological productivity must be concerned. In natural condition, generally, productivity of forest and lake are restricted by nitrogen and phosphorous, respectively. Then the linkage between terrestrial ecosystem and aquatic ecosystem is also important, the nutrient that leak out from terrestrial ecosystem to river and sea, during the process it is used by aquatic plants. On the other hand, once leaves are provided to river and sea, it becomes food of aqua culture, so that litter transportation from forest to river and sea is also an important factor. As for micro algae productivity in a sea, it is known that it is related with fulvic acid iron provision from forest soil in watershed. In order to analyze such nutrient and energy flux, application of stable isotope would be effective. Regarding such processes, to detect dominant primary producers and food web following the primary production is important information in every particular ecosystem element. In addition, information of species ecology for particular species is useful to conserve endangered species and to manage biological resources production.

However, in reality, actual watershed environment is affected by regional anthropogenic activities. It affects flux of nutrient, organic material, water, *etc*., respectively. The physical property of aquatic ecosystem greatly affects the abundance and fitness of aquatic organisms in their habitat. On the contrary, the species composition, life form spectrum and especially the presence of particular species indicates the physical and chemical conditions of the aquatic ecosystem. Regime shift of land use and farmer's practices may degrade water quality, which in turn would disrupt the lives of aquatic biota. It also allows application of bioindicator monitor of water quality changes of a river and related terrestrial aquatic environment. It is scientifically difficult to show evidence of

the good or bad effect of the anthropogenic activities in the vicinity of aquatic ecosystem, however aquatic biological diversity sensitively respond and record the impact in their character.

The human impacts on watershed environment should comprehensively be assessed. On the other hand, sewage system development and its optimal management, and environment conservation type agriculture, to prevent over harvesting of aquacultures are also to be concerned, as well as R&D of environmental technologies for environmental conservation and rehabilitation.

3.4. Human and Environmental Right in ESM

On this basis, it is going to be considered a more transformative theme. Once a significant problem is focused and that is researched for water and watershed management perspective, the next step will be making plan for ESM that is satisfactory among local people, government and nature, which sustains local economies too. It will be realized as balanced interdependable act between regional people and governmental system. Thereby, it needs to remember the problem in environmental assessment that even if government makes an environmental management policy with researchers and consultant companies, the policy is difficult to implement in many cases, *i.e.* even data is collected, it does not generate feasible information (McNie 2007, McNie *et al*. 2007, Timmerman *et al.* 2000; 2010, Ward *et al*. 1986), and a policy is beautiful but not feasible (Fisher 2002, Lawrence 2000). To overcome this problem is one of a significant application-driven social level research that potentially cat edge of current practice of sustainable development.

Based on the definition, once we start to consider this problem, it is recognized some critical points, in general, i) the responsibility of ESM is historically trusted from regional people to government, which academically is called public trust doctrine (Sas 1970), and people do not know the historical-logical background of it and government also often does not know that they are trusted the right of ESM from regional people. ii) water-environmental matter is basically-officially isolated from "environmental right" and "human's fundamental right" in law science (jurisprudence) and its applications. It is sometimes surprising for naturalist moreover and for common people. Although the legal system of one country varies from another, this situation is a worldwide phenomenon.

For feasibility of regional water and water management programs, the government is expected to instate an informed public participation in the environmental management scheme (Cash *et al.* 2003, McNie 2007, Timmerman *et al.* 2010). However, there is a contradiction as though if government accepts environmental right and human's fundamental right in legal system, it will be difficult to have dialogue with an opposition. It may seriously disturb public utility for regional development and management. Plus, even if government transfers the right to public, it may not enhance people's commitment to volunteer in activities for environmental management programs and projects. Thus, subsidiarity is focused on from bottom-up approach by human fundamental rights and environmental rights and top-down approach of governmental regulation. Thereby what both of these environmental management and environmental impact assessment eager is the same as informed participation in fact.

Herewith, environmental education has property that settled on human's fundamental right and environmental right as a property of the human's right to live as ethics and objective back ground. One of the goals of environmental education is to develop citizen-scientists who are well-informed for one's environment. Environmental education has credible potential *via* developing actual social devices to encourage participatory environmental management. The informed participation is expected to take contribution from environmental education to ESM. From this perspective, the balanced interdependability between environmental education and governmental environmental management program may achieve an integrated approach as feasible ESM scheme.

3.5. Two decision making approaches

There are scientifically two types of problems that are forward problem and inverse problem. In a case of if complete knowledge is available, the cause can be firmly predicted, and action to solve the problem can be taken (Fig. 2a). It is expected to solve problem by deduction procedure, the approach is called as deontological in ethics. The problem of this approach is difficulty to combine new idea and information in the inference process and of course in the decision. Thus, the logical pass tends to be ad hock devising (Jaynes 2003). In addition, the inference from deontological decision is from the complete information of what decision maker has, however it is only from intuition from available information in reality. When this matter is considered for the systematic problem of EIA and difficulty of integrated watershed management program, which are policy implementation gap (Fisher 2002, Lawrence 2000) and data-rich-but information poor syndrome (McNie 2007, McNie *et al*. 2007, Timmerman *et al.* 2000; 2010, Ward *et al.* 1986). The couse is because of the policy making process is mainly based on deontological.

On the other hand, it is fact that actual problem solving processes are always inference from incomplete information by inductive rationalization – the principles for assigning probabilities by logical analysis of incomplete information – is not present at all in the complete information system (Jaynes 2003). Regarding the context, what is required in environmental decision making is to consider and adapt to new approach in the fully half of probability theory in real environmental decision making process. The image is able to be explained by introduction of inverse problem solving process by inverse regression estimation process (Fig. 2b). In the inference process, the first step is to program potential consequences, and the next step is to choose more credible solution under given information. Accordingly, the inverse problem solving process is new idea and knowledge, and moreover consequence sensitive approach in ethics. In the context, installing precautionary principle in environmental decision making process is challenging to implement

consequence sensitive environmental decision making approaches. It can be understood the public participatory approach is making environmental decision feasible consequence by particular programming process on be half of what peoples coincide with the actual consequence in the future. This is the reason the multiple dialogues by informed public perticipation is eager in environmental management as it is the process to draw up own potential consequence and make candidate actions, and chose action to be take for their own environment (*e.g.* community water policy). It is the reason to willing volunteer participation in ecosystem approach with dialogue amongst a wide range of stakeholders; it expected to provide guidance on the 'best' options for a future action (Cash *et al.* 2003, Gauthier *et al.* 2011, McNie 2007, Timmerman *et al.* 2010, Tippett *et al.* 2007). In this point of fact, implementation of volunteer participation in environmental decision making process is considered as the process to mitigate the inconsistency between governmental environmental regulation and peoples' fundamental right and environmental responsibility. The balanced nature of relationship between government and people is wise coexistence in between different elements of society. The multilevel individualism is to be analogy to understand the positively intra-dependable relationship between these.

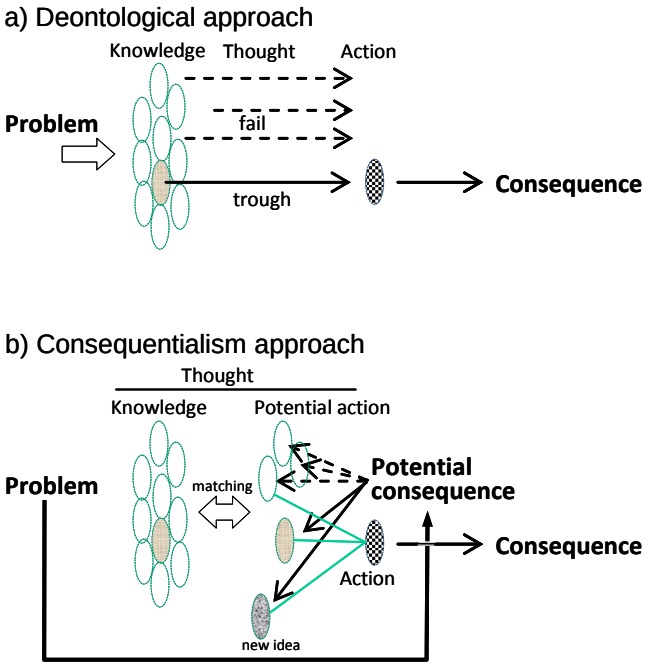

Fig. 2. Schematic depiction of two decision making models. a) deontological aproach solves problem *via* forward problem solving, *vice versa*, b) consequentialism approach solves problem *via* inverse regression estimation.

Accordingly, the next paradigm of environmental management that i) the knowledge body is fit with people's model, ii) the capacity to assume the potential consequence is well matured, and iii) ultimate value to manage regional ecosystem service is the regional consensus. According to these perspectives, Indonesian-Malaysian approach of regional environmental management is considered from Islamic thought as follow.

4. Indonesian-Malaysian Approach

4.1. Dogmatic and Informed individual approach

Once the human's fundamental right and the environmental right are considered in an Islamic country, a sense of significance for Islamic thought comes out, as well as a culture that is as fundamental part of people's property with their historical environment. The approach has matching with legal system and more so match with peoples' model. Thereby Islamic perspective is obliged to formal from the *Qur'an* and *Sunnah* (the practices of the Prophet). Next in the Indonesian-Malaysian approach, it is compared between the discussion for dogmatic approach and informed individual approach in which the fundamental is same, so what is more is just difference of aspect in the same system. The nature of agreement among these differences is talked from taking analogy with the multi-individualism in ecosystem level biology in this paper.

4.2. Dogmatic Approach of Islam

According to dogmatic approach of Islam, it should be an Islamic way to develop human capital based on the basic Islamic teaching, categorized as *Tauhid*, *Fiqh* and *Tasawwuf* (*Sufism*). The development should be globalized and balanced, as such shown in the following nature. Within the body of man, there are four elements that are very important, namely, the physique, the mind, the Lust and the soul. We should be aware of these elements, which should be cultivated, developed and promoted in such a way that one could have an integrated personality. We should take care of them and administer them the best way possible, so that mankind can be aware of his humanity and can appropriately act as the servant of Allah and as vicegerent on earth. Otherwise, mankind will only appear to be human but his and behaviour will be that of animals and Satan. Then such a person will ruin themselves and other people and in fact will destroy all life and civilization on the surface of this earth. As such, Islam strongly advocates that the four elements in the body of man is be taken care of, nurtured, administered and put in the proper place in accordance to its roles. This is such that, the four elements can contribute to the good of the individual's self, to the universe as a whole congruent and to the demands of Allah upon humankind as His servant and vicegerent on earth. To do so, one should be encouraged to be God fearing besides the knowledge of God's Greatness. It will be the vital force that makes one to be dynamic, intellectually and wisdom to God's vicegerent on this earth, manage the life with harmony, and love and care. It needs teachers or masters who have five basic personalities; knowledgeable master (teacher), leadership, fatherhood, motherhood and friendship (Fadil 2004). An approach based on Malay traditional values which is in line with our philosophy of national education simplified as JERI, *Jasmani*

(Physical), *Emosi* (Emotional), *Rohani* (Spiritual) and *Intel/aqal* (Intellectual) toward answering or responding to those issues mentioned above. It is an integration of traditional and modern values that could become the foundation strength for human capital development.

In the context, if the approach is the dogmatic, it tacitly indicating the approach request to have complete knowledge for Qur'an and Hadith in Islam. If the approach is deontorogical, it may indicate the risk for consequence insensitive. Due to the nature discussed before (shown as Fig.2b), if potential approach is consequence sensitive, it will be based on inverse regression estimation for Islamic thought and also sufficient new knwldge as well as new ideas (Fig. 2b). We assume, the consequence sensitive thinking is informed individual participatory approach in this study as discussed next.

4.3. Informed individual approach

From multi level individualism in the concept of ecosystem level biology, each life has independence as separated portion from ecosystem in nature. Simultaneously, they have crucial connection with ecosystem through exchanging water, energy, and other materials, where same property of ecosystem emanates to be each individual. By the definition, difference among lives and ecosystem is only a difference between the views of individual or ecosystem. For example, a living individual is uneven distribution of life in an ecosystem, and all are interrelated, *i.e.* chain of lives in an ecosystem are universally distributed in each life, where all lives fundamentally constitute one life on behalf of their ecosystem. The multilayer individualism in ecosystem level biology has potential to fuse the difference between individual and environmental issue. If this thought of biological multilevel individualism is taught in environmental education, and then students are informed, they understand the nature of participation to the ecosystem service management.

Sukarsono (unpublished 2012) showed that, Islamic leaders who respect and have responsibility for nature conservation have basic principles for relationship among ecosystem components, even if they usually need more detailed information about biological diversity, life-form spectrum of regional biota, natural balance and sustainability. They use a standard of value by an Islamic foundation that God says "*Maha suci Allah, tiadalah sesuatu diciptakan secara sia-sia*" (Most Holy Allah, there are nothing created useless). However the situation usually is that there is a gap between scientists' and religious leaders' knowledge. Sukarsono (2012) has tried to arrange several information for ecological behavior of forest animals in their ecosystem in order to bridge the gap between scientists and common people. Such effort will bridge scientists and Islamic religious leaders, which is just beginning but will be significant in Islamic countries (Sukarsono 2012). This is a good analogy for water and water environmental issue.

In fact, in Holy Qur'an, the word "Water" has been mentioned many times and repeatedly. Holy Qur'an says,

> 'And one of His signs is this, that He (Allah) shows you (Muhammad) the lightning as a source of fear and hope, and He sends down water from the sky, and quickens therewith the earth after its death. In that surely are Signs for a people who understand'. (Surah Ar-Rum, 30:24)

And this is another word of God in the Holy Qur'an:

> 'Do not the disbelievers see that the heavens and the earth were a closed-upmass, then We opened them out? And We made from water every living thing. Will they not then believe?' (Surah Al-Anbiya',21:30)

Water and nature are grace from God (Allah), because God is the creator of the universe. According to the holy Qur'an, in previous times this nature was arid, and there was no life there. But after God give rain from sky, the earth becomes alive. It was after the provision of an abundance of water that life began. Then until now, we enjoy the result of God's creation. This is the meaning of the grace of nature. Water and nature are grace and mandate from God to us and we as *Khalifah* (manager) of nature, and have a responsibility to keep and manage them. So, our activities today are addressed to keep water and nature.

Islam always teaches believers to pay attention to cleanliness. Water is used for various purposes, so that the cleanliness of environmental water is also insisted on with high priority for hygiene. For example, the Prophet's Muhammad *sall Allaahu 'alay-hi wa- sallam* (May Allah pray on him and grant him peace) hadith narrated by Bukhari-Muslim: "Do not one of you urinate in the stagnant water, which does not flow, then bath in it", which is prohibition of piddle in the water that does not flow is one way of protecting the environment and the conservation of aquatic ecosystems. Another example for water conservation is cited from hadith that is commanded by Muhammad *sall Allaahu 'alay-hi wa- sallam* (May Allah pray on him and grant him peace). In the hadith, water is an essential component for the Muslims in performing obedience to God. Muslims need water for purification of unclean, small and large hadath when going to worship.

In this regard, the Prophet set an example to his people to conserve water, in the hadith which reads: The Prophet used ablution each time he wants to pray. This is the prophet's general condition. Sometimes he precedes ablution for prayers with a single ablution. This is commonly narrated by Muslims. In another hadith, the Prophet had also mentioned that residual bath water left after a bath for Maimunah (the Prophet's wife), narratives of Ibn Abbas (the Messenger of Allah), and Maimunah (Saheeh Muslim 487). The thought for residual water in this case is water that was not used by Maemunah for bathing was still in a state of purity and cleans in a tub. An Arabic word "*Mubazir*" (wasting something) explains wasting some ordered material away without utilization, which tells inefficient selfish use of resources. In

Maimunah's story, she did consider water as a resource to be wasted but judiciously utilized. This indicates multilevel individualism and social responsibility towards others. This attitude gives consideration against *mubazir* and may firmly be related to the concept to sustain water and water environment in good condition.

5. Perspective of Islamic Thought in ESM

5.1. Toward Environmental Education

Considering these two approaches, Islamic thought is matching with theory of multi level ecosystem biology and ESM respecting water and water environment. However, environmental education in current situation is not really interactive with real processes of environmental regulations. Moreover, it is not really matured in Malaysia and Indonesia, even though it is inevitable for the next generation. On the other hand, Islam also has thought for environmental matters, though the actual interaction in environmental management field is less in reality. Interaction between scientists is also not really frequent.

Once we consider goals of environmental education, it is summarized into six points: awareness, knowledge, attitude, skills, and participation (UN 1972, UNESCO 1977). This definition is widely accepted and environmental education concept is developing as a worldwide current consensus. In the context, it does not augur well to use one-sided knowledge transfer from teacher to student, and ask informed students to follow the taught attitudes. What is expected here is to develop attitude and skill for self-motivated education which can yield knowledge and participation to the development of an environmentally sustainable society. Accordingly, to teach environmental knowledge to students is important, but more important point is participatory for experience based educational activity from student. Those are respectives with deontrogical approach and consequentialism approach in Fig. 2. In many cases in Indonesia, teaching method is based on interactive models. In a subject of environmental education, improved teaching methods is needed for learning models, but it is more important to develop teachers' capacity for the interactive model especially experience based perspective.

Hereby what is required is more advanced matter to combine different sectors among environmental education (school, local community), research (universities), and authorities. Theoretically, the expected scheme is that students get their own knowledge through one's direct experience and interact with friends, teachers, and advisors, then gradually develop one's body of knowledge for environment that also generate one's attitude for participation in environmental concern life style and further in social environmental governance. In order to precede such environmental educational program, useful program, and also tool are required to be developed.

If another drawback is considered that is the circumstance of current development paradigm which is very secular, capitalistic and hedonistic oriented. We saw that models and approaches also using the same approaches in education. It is commonly known that the social circumstance degradation affect one's environment and it is quite an impossible trend to be improved. The application of Islamic thought is expected to be a new approach in environmental education as a platform of part-oriented environmental management to gain happiness of the world, and also in places when we die - the afterlife as it is taught by the Prophet Muhammad *sall Allaahu 'alay-hi wa- sallam* (May Allah pray on him and grant him peace) in the Qur'an: "O our Lord, grant us happiness in this world and happiness in the Hereafter ".

5.2. A Solution *via* being Close with God

The interrelationship between Islam thought and ESM can be considered from one of Islamic foundations called *Tasawwuf* or *Sufism*. *Sufism* is a way that Muslims look for their God. The aim of *Sufism* is to approach as closely as possible with God so that Muslim can see Him (God) with the eyes of the heart and even the Muslim's spirit could be united with the Spirit of God. God is spiritual, and then the part that can get closer to God is spirit, not his body, and God is Glorified, then it is acceptable to approach God as a holy spirit. *Sufism* is the Islamic science that discuss about the problem of human approaching to God through the cleansing of his soul. In the teachings of *Sufism* there is a saying which states that basically the earth is a mosque for Muslims. For the Muslims, the mosque is a sacred place where we should not pollute the mosque and should not make noise in the mosque. This Islamic's view of the environment is also from Islamic sciences of *Akhlaq* (ethics). Hence, we recognize when we use natural water like water from well and spring along river, we can consider this as a "*Nikmat Air dan Nikmat Alam dari-Nya"* (Grace of Water and Grace of Nature are from God's will) and environment concerning life is to "*Alhamdulillah syukur"* (Praise be to Allah). This could be a principle to conserve and manage restore water from environmental point of view, and meaning to use clean and safe natural water with peace of mind for our healthy life.

Islamic view on environmental protection can also be studied from the perspective of Islamic Theology Science, which is an Islamic religion foundation, about the position and the presence of humans and the environment, including these roles in the world. Environmental protection is also in the perspective of Islamic *Fiqh* Science, which is science that governs human relations with God, themselves, their families, communities and the natural surroundings, whose application is for the protection and preservation of those things of the which are dangerous and destructive. For example, Sukarsono (2012 unpublished) stated that Islamic people will have a high commitment to water conservation when they have a good value system, in that as a muslim believer they have to pray to God five times in a day and before that we have to clean our body as ablution with water that is a preliminary to the occasion of standing to God's presence. Muslims also have obligation to purify uncleanness after intercourse or bowel. Without purification, all worship of God is to be invalid. Hence, how can Muslims precede purification if there is no water? How can Muslims get the water without conservation and wise management of our land or forest? Water is only one that is always being found in each scripture of the *Fiqh* (book teaching us the ways of worship to God). We can recognize that description of water has always

been in the first chapter that discusses about *Thaharah* (purity). So the water is an absolute requirement to use before all the Islamic *Ummah* (community) can get close to God. The thought for environmental protection in Islam can also be taken up from the perspective of "*Usul Fiqh"* (principles of jurisprudence) primarily in "*Maqashid Shariah"* (purpose in Islam) objectives that are used to enforce the benefit of the world as well as hereafter. This *Shariah* are then called "*al-dharurah al-Khamsa*" (five basic benefit that became the foundation of the establishment of human life) *i.e.* religion, life, lineage, wealth, and intellect. Maintaining and preserving the environment means keeping the five foundations of human basic needs. Sukarsono (2012 unpublished) stated a model for how to implement this doctrine into environmental education. Hereby, it is solemn that sources of all the Islamic perspectives must be derived from the Qur'an and Sunnah (the practices of the Prophet), which is the knowledge body of consequentialism approach in Fig. 2b.

5.3. Toward real approach development

Water and water environmental issues are stated with high order of priority in Islamic thought, where a phrase "grace of water and grace of nature from God's will" symbolize the premise of the issue and the other phrase "Praise be to Allah" ultimatery can unite peoples' mind and ultimate value of regional ecosystem service in theoretical level. This function is primary important in the decision making framework of consequentialism approach (Fig. 2b) in order to generate candidate solution program, and fit with people's model and regional consensus for Muslims. In the Islamic thought, there are comprehensive knowledge body for water and water environment based on *Qur'an*, *Hadith*, and Islamic Fiqh Science, and *etc*. The knowledge body is adequate to fit with people's model in Indonesia and Malaysia with modern scientific knowledge and on demand research activities.

Currently, it is tried to implement participatory approach into surveillance environmental monitoring and EIA (level 2 in Fig. 1) that is expected to be transformed to strategic environmental assessment and integrated environmental management. However there is difficulty to get progress in reality. The problem will be complement by installing driving force of participatory approach.

In line with regarding, once regional branding will be more concerned in ESM framework, participatory approach and social dialogues through consequentialism approach will be just common element in the cyclic relationship among strategic environmental assessmen, integrated ecosystem management, and regional branding. Due to the nature, it will be natural demand for scientific information, Islamic thought, and cultural thought. In the framework, multiple social dialogues will be the main component and process of ESM (Fig. 3, Level 2), in which, integrated environmental management and regional ecosystem branding with strategic environmental assessment will consist of the elements, and in total the potential ESM framework will be a river basin concil. As a consequence, EIA and surveillance environmental management will be functioning as arm of ESM framework (Fig. 3, Level 1). By the statement, it is assumed the cyclic interaction between regional ecosystem branding strategy and environmental education will provide mortivation and human capitals development as the driving force to the potential ESM framework.

Following all these discussion, it is considered the potential perspective is to aid environmental education linked with regional branding strategy. It obiously, request actual environmental educational program with affordable tools, and also, governmental policy for new ESM framework (*e.g.* national river management directive) that will bridge among conventional approach, Islamic thought, regional cultural background, and reagional branding..

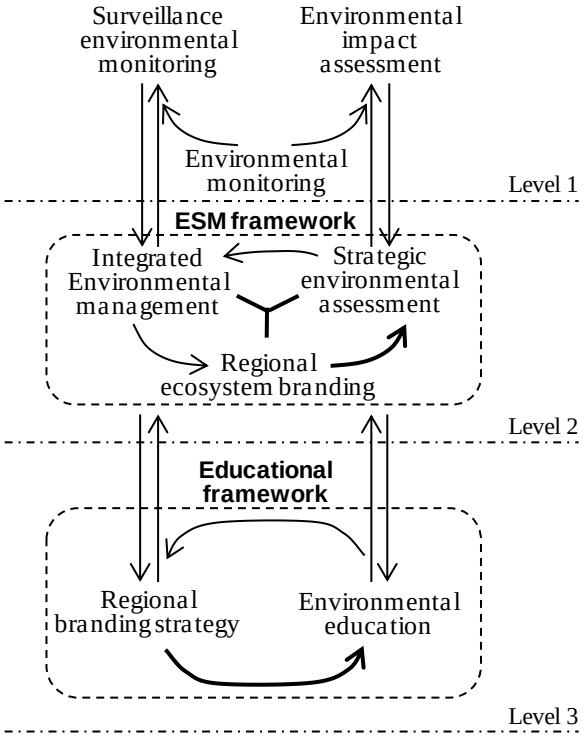

Fig. 3. Schematic depiction of potential ESM framework. In this scheme, Islamic thought takes fundamental thought aid environmental education at Level 3 that finally refrect to reagional branding strategy and Islamic thought will will improve it continiously. ESM framework will be strategic legal framework of local government (Level 2), and has functional arm of environmental impact assessment and environmental surveillance (Level 1).

5.4. Rationalism to Universal design of ESM

We are assuming Islamic thought is effective to encourage environmental education in Indonesia and Malaysia as it will effectively enhance public participation willing to regional branding *via* environmental multiple governance of ESM framework (*e.g.* Watershed concil). In the process, application of consequentialism approach (Fig. 2b) by informed individual approach is considered as more effective

than deontrogical that is defied dogmatic approach (Fig. 2a). Consequently, it is being concluded that the integration of Islamic thought and environmental education has significant feasible potential to ESM in Indonesia and Malaysia. Thereby, it is obvious the work is to be developed toward more comprehensive, gently involving some other races and countries in the regions in regard to the fact that the ecosystems of the region can not be separated by nation. The country like Brunei, Timor Leste, Singapore and Thailand, as well as, other south eastern Asian countries are in fact interconnected each other.

Once such socio-ecological inter-related diversity is considered, it will be consequenced that the potential holistic approach will include several or many behavioral principle for each of unique traction due to different religious, economical, local cultural contexts. It is requirement of boundary condition to furnish meta-introductory system for ESM scheme. Herewith, what we are considering is robust and uniform framework for ESM and out put is to be harmonized with each of the diverse socio-ecological conditions.

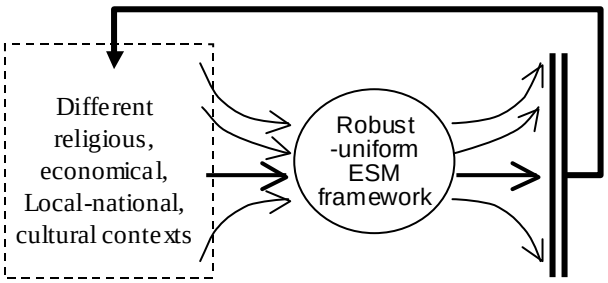

Fig. 4. The statement of the robust-uniform ESM framework and diversity of socio-economical context. The thick line indicates Isalmic approach. Combination of Islamic thought and ecosystem brand management *via* ecosystem approach will produce firm scheme of universal ESM framework, which can be shared with others.

Hence, our potential scheme for ESM will furnish three parts, that are consisted with meta-introductory unit, firm body of ESM framework unit, and meta-characterized out put unit. Hereby, it is different matter that Islamic thought can provide the complete total system of ESM or not, where the most significant is the potential of Islamic thought that can provide the firm body of ESM framework unit by informed individual base consequentialism approach (Fig 2b) with tolerance to coexist with other diverse socio-ecological and meta-religious conditions. The advantage of our approach is the potential to develop good example of holistic ESM system as a firm analogical texture to others. It is more than difference of gener, generation, race, countries, and religions. We have been considering the credibility of our potential ESM scheme will indicate the truth of Fiqh Science and Islamic thought in ESM for water and water environmental.

6. Conclusions

1. Islamic thought and concept of ecosystem a level biology re matching each other for the participatory and integrated water and water environmental management.
2. The system of knowledge body is different, though, there are analogous figure between ecology and Islamic Fiqh science.
3. As an Indonesian-Malaysian approach, the integration of Islamic thought and ecosystem branding,environmental education has significant feasible potential.
4. The potential of the approach are:
   i) to develop citizen scientists, who are well-informed persons and have potential to participate ecosystem service management,
   ii) to improve the limitation of environmental impact assessment *via* strategic environmental assessment,
   iii) to enhance integrated regional, watershed, coastal area, and these of integrated management program,
   iii) to enhance the Subsidiarity among environmental education, governmental environmental regulation, regional well considered policy making, and regional ecosystem service management for water and water environment.

7. Bibliographical introduction

This paper was written by positive participatory open collaboration by web conference. This paper is written *via* interactive way between a non Muslim person of Dr. Akira and other Muslim persons of conference organizing members. The paper drafting has started from a phrase that Dr. Akira has pointed with Ms. Eman, and Ms. Narges that is "*Nikmat Air dan Nikmat Alam dari-NYA*" (Grace of Water and Grace of Nature are from God's will). Then the sense in Islamic thought was answered by Mr. Romaidi that was third paragraph of section 4.3 and first paragraph and middle part of section 5.1, respectively. This ethical position is still core of this paper. Then, Mr. Sukarsono has participated and wrote the second paragraph of section 4.3, 4th paragraph of section 5.1, and 2nd paragraph of section 5.2. The draft of this paper were distributed to many related researchers by this conference, then Dr. Sumitoro concerned for globalization of the discussion that is first paragraph of 5.4, then Dr. Akira wrote the other part of 5.4. Ms. Retno also contributed to write for common condition of Muslim and introduced a story of Maimunah (Prophet's wife) at the last paragraph of section 4.3 that indicates judiciously utilization of resources. Mr. Dwi contributed on writing bioindicator that is 5th paragraph of section 4.3 and introduced Islamic story that makes theoretical discussion's sense more actual that is 4th paragraph of section 4.3. Dr. Fadil added information for dogmatic approach as 4.2. Relating these contributions, other parts of this paper from introduction to conclusion were written by Dr. Akira through out web conference. The aspect was complementation between proposed Islamic thought and conventional scientific approach towards integrated coastal and watershed management *via* conbination of experience based environmental education and scientific researches. Then finally, a theoretical model of universal design of Islamic thought application on integrated ecosystem services management for water and water environment is considered

as Indonesian-Malaysian approach *via* Fig. 3 and 4. The model will be improved via another web conference till next conference.

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