The “jamban systems” as coping to both of land use and climate change impacts in rural area

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Abstract. The role and its contributed to “the jamban” as a system to water harvesting methods which considered was able to cope with climate and land-use change impact conventionally, chiefly to drought phenomena, and it would have become of one strategy to water supply type development in urban or rural areas. The aim of this research to explore and analysis of the role and its contribution to “the jamban” functions in their daily, so the direct observation and in-depth individual interview methods which is used to data collected, who at least 10 – 15 respondents as participatory of this research and it’s also to focus group discussion (FGD) with some of the personages in these activities, so the result of this research, shown that “the jamban” as a system, which is part of adaptation type development to climate and land-use change impacts, chiefly to the response of drought or water scarcity dynamically, alongside it used to local economic developed to meet a demand of family or community-scale in their daily, and indirectly it would be a sustainable paradigm at a local knowledge perspective in water conservation development at a local scale.

1. Introduction
Developing to water harvesting method [1], which would be used to cope of the drought occurrence [2] dynamically that caused of climate [3] and land-use change impacts [4], alongside to loss of the productivity of farming, the flood, and the drought occurrence [5], therefore it necessary to respond actively and creatively, which its hope to solution alternative in coping to climate and land-use change impacts, chiefly to drought occurrence and it would be impacting to desertification occurrence [6], and Eckholm [7] revealed that desertification is a world problem or global change [8] to human being [9] and the other negative impacts, chiefly to water scarcity [10]. Hence, creating to water harvesting development in coping to drought occurrence, alongside in shaping to social-ecological resilience [11] is needed, where is a site of conservation areas or a hilly type that have many of ecological function, mainly as a catchment area functions, but now it has confronted to ecological disturbance, and its leads to. Hence, a hilly characteristic has become of the susceptible to change areas, therefore it necessary to land management kindly and sustainable to an equilibrium of ecological system shaped [12].
Most of a hilly characteristic of the site has changing been functions, especially in West Java has a water crisis to drought occurred, when is the dry season, so the local people is not easy to water availability kindly. The Jamban as systems, which is part of one adaptation pattern developed in coping to drought, chiefly in a rural area, alongside its ability to the wellbeing of the local people with various economic activities type [1], which is both to the aquaculture and aqua-plants developed. Empirically, the Jamban systems are the one way that considered could be coped to climate and land-use change impacts dynamically and effectively, because of the local people depends on water availability in their daily activities [1], so the most of the local people created to Jamban systems development in their surroundings in which it would be coping to water scarcity kindly and sustain, alongside to welfare or local economic increased. Hence, identifying and analyzing the jamban system functions and its various types developed by the local people based on rural landscape ecosystem type [13] is needed and is also based on local ecological knowledge.

2. Methods

The site of research in Cikolong village areas administratively is a part of Tasikmalaya Regency (Figure 1), it’s geographically the Cikalong area site of plateau landscape characteristic, which has reputed as a conservation zone, then Cikalong area site of geographically at least 100–500 masl, alongside its areas part of a hilly type. Empirically, the drought in Cikalong was occurrence every of years, when in the dry season, alongside where altered forest to agricultural land was immensely, so directly it would be affected to an ecosystem, chiefly to water availability, therefore, in this research endeavored to comprehend of local people’s view about multifunction of Jamban systems in their alive so long as dynamically. inventorying and analyzing to water harvesting method developed by the local people is needed, because of a key role of important to reveal of usage type in their daily such as the aquaculture and the aqua-plants development [1]. Hence, direct observation and in-depth personal interview, it’s also
focusing group discussion (FGD) is a key role of importance in data collecting to complementary qualitative data (field data), so there some of the respondents were personage and inhabitant, at least 10–15 respondents who they have “Jamban systems” in their dwelling of surroundings that used to water harvesting developed (traditional technique) and some of the personage. These were part of data collecting for analyzing to determine to purposed of Jamban systems in their daily, and it how to the role or contribute to Jamban systems as water harvesting methods in coping to climate change impacts of drought-related, alongside to response of land-use change impacts [10][14], which was related to the hydrological change of process, so it has caused of the loss of water availability extremely and its slowly to water crisis occurrence.

Refers to the description above, this research is more exploration the role and contributed to Jamban systems (water harvesting method) on their daily, chiefly to cope with drought or water crisis occurrence, particularly in the dry season, alongside how to do it, in managing of water scarcity on land-use change impacts (conservation areas to economic areas changed) with synergy and kindly [15].

3. Result and discussion

Utilization of Jamban as a system in a rural area has increased and it has considered as water conservation development at a local scale, alongside as local economic development [1] is an example to both of Aquaculture and Aqua-plants (Aqua-economic) methods developed (Figure 2), which has exhibited to a variety of Jamban type at a small scale with the size of varieties to water availability, chiefly in the dry season. On the other hands, at the middle-scale, the local people are also utilizing the grave as grove area functions, mainly for catching and storing of water naturally to water availability kindly and sustain (Figure 3), alongside its one part of coping to the drought that caused of climate and land-use change impacts [16]. According to FGD (Focus Group Discussion) results that “Jamban or pond” as water availability systems development, which one is alternative solution or choice that exactly (depend on the geographical type), alongside it would be lead to adaptability to changing condition, mainly to the watershed (the drought).

3.1. The jamban as water conservation systems at a local-scale

The building of local institutional [17] or social resilience system is ought to do in response to climate change and land-use change occurrence massively and destructively [18], where have threatened an ecosystem of stability (ecological disturbance or environmental hazard), which one is the drought occurrence. Cikalong Village is the one of site, in which tried to cope with drought with the Jamban systems or water harvesting methods traditionally and its ability to create water security on supply to daily activities for example to aquaculture, aqua-plant, and forth [1], and according to Pandey et al [19] and Tolossa et al [20], that rainwater harvesting is one way to cope with climate change impacts, alongside it part of an alternative solution to overcome of the drought occurrence kindly and sustain. Therefore, the Jamban systems are also part of the water conservation paradigm at a local scale in which is based on local knowledge [1], alongside its ecosystem characteristic, where at Cikalong Village is including a hilly type, where is now susceptible to an environmental hazard, which has because of the local activities massively and destructively. The Cikalong Village is one of the sites that the drought occurrence in which is not only caused by climate change impact but also the land-use change related. Hence, it necessary to pay any attention to all of the sides in land management (a hilly to plateau type) kindly and sustainable to water availability disturbed, alongside it’s also coping with climate change impact kindly and dynamically.
Refers to these cases above, that the local people tried to water manage kindly, which one is the Jamban system methods conventionally developed, so its method able to support to their alive with sustain, alongside it able to local economic creative development (Figure 2). Hence, the building of local scientific based on field problems (local ecological knowledge), which strengthening is both to adaptation patterns and local people’s position in receiving ecological disturbance, in their surroundings effectively, which one is used to both of aquaculture and aqua-plants development (Figure 2), alongside it used in coping to drought (climate and landscape change impacts) at a local scale. Hence, the Jamban system is a way to cope with drought locally and effectively, alongside its part of an alternative solution to water supply kindly and sustain at a local scale, and it leads to the welfare of the local people. Hence, Building of adaptation pattern developed [21] creatively and innovatively has become of a pivotal and its part of a key role to the response of the climate change impacts and land-use change impacts kindly [15], which this matter is unpredictable, so elaborating of modern or scientific knowledge with local knowledge (local wisdom) is considered able to more accurate, flexible, and dynamic. Finding to field problem to the result of problem-solving based on field data has become of more accurately (qualitative, quantitative, and mixed methods), wherein Cikalong Village is tried to create and to develop of water harvesting applied based on landscape characteristic, alongside to suitably with a land area to local people owned by Jamban systems developed.

The Jamban as systems is one of type and its part of the water conservation paradigm, which many of function were economically, socially, and it's more importance to ecological aspects in influencing to the equilibrium of system ecology (stability of ecosystem) shaped, which is one of the factors to ecosystem services related, chiefly to water storage or stock naturally for the local people and the others. Hence, Building of adaption pattern with Jamban as water conservation systems developed, which is part of coping with climate change effects in where is applied in Cikalong Village as the model developed and it's hooked to water availability in dry season happen.
Figure 2. The Jamban type with a size of varieties and its functions, which (A), (B), (C) is used to aquaculture development, alongside to water availability to the other functions (E) and (F), whereas (D) is used to aqua-plant development.

Figure 3. (A) The Grave as grove areas in rural areas, where is one of the protecting areas development type by the local people.

Figure 4. (A) Water harvesting model at a small scale in farmland, (B) The Well as water storage inside of a dwelling, (C) Water storage in big place (big gallon), and (D) The Jamban as the system developed in rural areas.

3.2. The water storage of various type to cope with drought occurrence

Refers to the description above, that inventing and developing to water harvesting methods is part of the adaptation pattern developed that doing to parts of the local people in rural areas, where it also depends on a land area owned by local people and awareness with together in response to water unavailability consistently, but the other side empirically, the each of dwelling in Cikalong Village has Jamban systems owned with various of a type developed (Figure 4), where is used to water storage or stock? The Jamban systems are one way to cope with water scarcity in a rural area [1], and it is based on landscape type suitable to apply to it, where is a hilly type, so it necessary to determine water harvesting model developed to obtain water availability by sustain.

Creating innovative traditional techniques of water harvesting developed in a rural area (Figure 4) that done by the local people in Cikalong Village, which one has become of the local people acted in coping with drought dynamically, mainly in the dry season. Commonly, in Cikalong Village is a hilly type, where is the susceptible area to water availability that is
because of land use and climate change impacts, which was hydrology of changed related, so it caused the loss of water availability. The water crisis or unavailability occurrence in Cikalong Village is part of the loss carrying capacity of ecosystem service to the water cycle, therefore, it would not function as catchment areas to water storage kindly (Figure 4), alongside it depends on the rainy season or upper of a mountain (a hilly type). Hence, the each of years in Cikalong Village has drought occurrence, where the local people is not easy to freshwater obtained, those are one phenomenon that the local people tried to create of water harvesting model developed in coping to drought, in Figure 5 above, Describing to water harvesting various of a type that developed by the local people at small to large scale, for example of the Jamban systems, is one type that increased and developed, which is look at Figure 4 (D), alongside it also is simple of methods and cheap to create, mainly in rural areas. Hence, developing to water conservation paradigm and it sustains consistently to maintained, also it's part of coping to drought, of course indirectly to social resilience system shaped in the middle of susceptible areas, alongside the local people has to be a highly sensitive dimension to environmental change, mainly to climate and land-use change in the rural areas effectively and actively.

4. Conclusion
Developing adaption patterns in coping with drought occurrence that caused both to climate and land-use change impact, and it’s one of the parts to mitigating activities type to solving-problem based on field data. The water storage or stock is one way to water availability to support their alive, so creating of water storage model is a key role to survive and adaptable kindly. Empirically, there was some water storage of type developed in Cikalong Village, which is purposed to water security response, chiefly to preparing of dry season occurrence, wherein Cikalong Village commonly is susceptible areas to water availability (the loss of water resources), therefore, the most of the local people in trying to create and to develop water storage as water conservation paradigm, alongside as the local economic development, so the Jamban systems is one of all source of alive of the local people. Hence, the Jamban systems are the one way to respond and to adapt to climate and land-use change impacts kindly, and it part of the source of alive to local people to water availability in their daily, mainly in the dry season.

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