Study of the public perspectives on the problems of Batang Kuranji River Basin management in Padang City, West Sumatra, Indonesia

F Nurpasari\(^1\), and R Febriamansyah\(^1\)

\(^1\)Integrated Natural Resources Management Study Program at Universitas Andalas, Padang West Sumatera, Indonesia

\(^2\)Integrated Natural Resources Management Study Program at Universitas Andalas, Padang West Sumatera, Indonesia

Email: finnanurpasari1126@gmail.com

Abstract: Batang Kuranji is one of the main rivers that divide the city of Padang, West Sumatera, Indonesia from the Bukit Barisan mountains in the east to the Indian Ocean in the west. Batang Kuranji River Basin has a 202.70 km\(^2\) watershed with the main river length of 32.41 km. Over the last three decades, there has been an increase in the frequency of problems caused by the declining quality of watershed management, such as upstream landslides, and flooding downstream in urban areas. This study aim to explore and identify the watershed management issues, from upstream to downstream, based on community perspectives along the river basins. Qualitative and quantitative data collection methods were applied through surveys with respondents, semi structured interviews with key informant and Focus Group Discussion with stakeholders. In general, each community group along the river basin has a explain more details of the more frequent flooding problems and the higher of flood. However, the factors that cause the problems for each community are different with each group blaming one another. This study explores these differing views between groups and provides recommendations for policy makers towards integrated management.

Keywords: Batang Kuranji river basin, public perspectives, watershed management, flood, landslides

1. Introduction
For over 20 years the world has acknowledged the integrated nature of water resources management and has worked together to form acceptable agreements [1]. United Nation Water Conference (UNWC) is the first initiate that goes on Mar de Plata, Argentina in 1977 and United Nation Conference Environment (UNCED) and Development in 1989 [1]. Decisions making on water resources management is latter to be awarded and almost neglected can solve with real participation to avoid conflict because of debate it is based on sector motion. Scheuman (2001) and Global Water
Partnership (GWP) suggested one of the key elements of integrated natural resource management is the need to involve stakeholders in the decision-making process. This means coordinating policy at all levels from national ministries to local government or community based institutions [1]. After the Dublin amendment in 1992, Integrated Water Resources Management (IWRM) emerged as the driving concept behind the management of water resources [2]. Now the IWRM concept has been accepted worldwide as the best way to improve water management. Indonesia has been implementing bold reforms since 1998, leading to new laws and regulations and supportive environment for IWRM. IWRM implementation in Indonesia is still difficult, because IWRM is not a national priority or the superior sector for national and regional development.

Current management patterns should be transformed towards adaptive management, integrating all stakeholders and holistic in the sense of incorporating elements that support the sustainability of water resources, i.e. environment, technology, economy, institutional, and cultural characteristics. Important terms related to integrated management are Integrated Water Resources Management (IWRM), Integrated Water Management (IWM) and River Basin Management (RBM). Though there are some differences between them, they all emphasize a process that is coordinated and the relationship between sustainability and economic and social welfare [2]. The development of the concept is due to the issues of water resources that trigger the tragedy of the commons due to the diversity of interest in the use of water causing scarcity of water resources, and causing conflicts in various places. In addition, Sriyono (2015) said the problems and challenges in water resources management practices in Indonesia imply that the government is ‘milking’ other parties [3]. Several challenges facing developing countries today include; cost and benefits being distributed unevenly, conflicting uses, the use of technology, uncertainty in watershed management and implementing the participatory approach [4]. Furthermore, GWP suggested Because water is limited, participatory approach should be implemented between users, planners and policymakers at all levels, the important role of women, and knowing generally that water has economic value.

By the previous research relating to the management of natural resources, especially water resources found that the current management pattern should be transformed into adaptive management, the existence of all stakeholders integration, holistic in the sense of combining elements that support the sustainability of water resources, are environmental, technological, economic, institutional, and cultural characteristics [5] and this argument similar to with Pahl (2006) [6]. As a whole ecosystem, watersheds must be managed based on the characteristics and linkages between upstream and downstream ecosystem components [7].

According to Law No. 17 of 2019 watershed is a land area which is an integral part of a river and its tributaries, which functions to accommodate, store and flow water that comes from rainfall to lakes or to the sea naturally, which is the boundary on land are the topographical and separate by the sea up to the waters that are affected by activities on land [8]. The destruction of watershed may occur due to the following areas: (1) Damage to the watershed itself, which is affected by; Increasing population and settlements thus damaging land and water conservation, erosion, sedimentation, decreased land productivity, land degradation, and flooding. (2) Forest condition, ie; The closure of land or vegetation changed rapidly due to population growth, unsightful development, forest land needs and forest products, as well as the presence of forest immaterial [9]. The problem and flow of Batang Kuranji watershed is quite diverse, including steep slopes that are prone to landslides and slopes of the river basin that can increase the potential flow of flash flood discharge. As for the main segments most importantly the uncontrolled river basin, the high flow rate and can destroy the cliffs and downstream segments with the main problem of low river, very high levels of sedimentation from River and pollution that lowers water quality. Development various models of management watershed still emphasize that there is a social asset needed; awareness, attention and cooperation of various parties to achieve success together in the management of sustainable watershed and to reduce the occurrence of natural disasters and conflicts in the community. So, it is important thing for knowing the community perspective to solve the problem in managing Batang Kuranji River Basin. This paper aims to explore community perspectives on current issues and challenges by identified the watershed
management issues, from upstream to downstream, based on community perspectives along the river basin.

2. Methodology

This research uses an exploratory approach with qualitative and quantitative data collection methods. Surveys method used to identify the community perspective on the problems of the Kuranji River from upstream to downstream. In addition, qualitative data were collected by conducting semi-structured interviews with key informants and Focus Group Discussion with stakeholders. The study was conducted in August until November 2017. The number of respondents who were key informants in the upstream area were namely the Patamuan dam guard and elder village leader and community leaders from Batu village. In addition, there were 30 respondents surveyed in the upstream area. Respondents in the middle area numbered 11 people consisting of P3A management from 5 villages along with extension counsellors and Gunung Nago dam Officers. Furthermore, for the downstream area there were 4 respondents consisting of community group leaders, former youth leaders, dam guards and community leaders. Data collection is done by means of surveys, in-depth interviews and focuses group discussions. Data analysis was performed descriptively qualitatively using questionnaires and interview guides and supported by secondary data in the form of photos and documents.

3. Result and Discussion

3.1 Study Area

Batang Kuranji watershed is one of the watersheds in Padang City which has an area of 202.7km², stretching from Pauh sub district to North Padang subdistrict and ending at the Indian Ocean. The Kuranji River Basin originates in Sikai Mountain and covers the Lambung Bukit village, Pauh sub-district. While the middle part of Batang Kuranji watershed includes other village of Pauh subdistrict and some village of Kuranji sub-district. The downstream area covers part of Kuranji sub-district, Nanggalo sub-district and North Padang sub-district.

![Figure 1. Batang Kuranji Watershed](image-url)
Based on the GIS analysis, the Batang Kuranji River Basin has a 202.70 km² watershed with the main river length of 32.41 km and the total length of the main river and other rivers are 274.75 km, thus the drainage density of the Kuranji River Basin reaches about 1.36 km/km². Batang Kuranji catchment area has very high gradient with 1.36/km river density with sub-watersheds: Batang Kuranji basin area is 19.86 km² with the main river length of 14.66 km, sub-watershed Batang Belimbing 62.64 km² with main river length 17.08 km, Batang Sungkai Sub-basin 6km² with main river length 3.63 km, Batang Janiah/Karuah basin 82.26 km² with the length of 18.86 km, and Limau Manih sub-basin 31.93 km² with the main river length 16.42 km. The width of the river in the middle of the Kuranji basin averages 50-80m with a depth of 2m-3m. The downstream area of Kuranji basin has a width of 80m within depth about 2m-3m.

3.2 Public Perspectives on the Problems of Batang Kuranji Watershed

Batang Kuranji watershed is one of the existing river basin in the city of Padang that stretches from Bukit Barisan National Park to the District of North Padang. Batang Kuranji River Basin is the largest watershed among several watersheds in the city of Padang. Batang Kuranji watershed as one of the main water resources used for agricultural irrigation and clean water. Batang Kuranji watershed area is also made and important settlement for communities.

In general, respondents and key informants revealed that Batang Kuranji watershed catchment area in the upstream area is still relatively good compared to other watersheds. However, in recent years, there have been floods in several areas along the Kuranji watershed, causing destruction of the sub-watershed of Limau Manih. Flash floods that hit the city of Padang several years ago caused much damage to the community and local government. The flooding incidents were also closely related to the decrease in land cover and high rainfall [10]. In addition, differences in river flow altitude are also one of the causes. There are several factors that cause flooding. These factors are natural conditions (geographical location of the region, ground conditions, river geometry and sedimentation), natural events (rainfall and duration of rain, tides, backflows from major rivers, river basin damming due to landslides, sedimentation and cold lava flows), and human activities in land-use changes that impact on catchment areas which then affect the conditions and changes in runoff changes [10]. In addition, a very significant difference in height between the upstream, downstream and the middle if the upstream of the water flow increases can cause the downstream area to be flooded. These floods can cause landslides that occur in the upstream and downstream. Many community homes and other infrastructure can be damaged by disasters like these. Recently the community felt a decline in water quality and frequent flooding caused the community to accuse each other. Therefore, to find facts and valid field data, researchers summarize data obtained from upstream to downstream areas supported by secondary data in the form of photos and documents obtained from key informants and government agencies. Thus, the community can assess objectively and can discuss together in solving problems with the needs and availability of water.

3.3 Publics Perspective in Upstream Area

The upstream area of Batang Kuranji watershed is located in Lambung Bukit village, Pauh sub district with a total area of 38.80 km². In this area there are still rice fields, forests and community settlements. In general community in Lambung Bukit village resident is working as a farmer. the total population in Upstream area estimated at 3,650 people with a population density of 94 people per km. The temperature 20°C-28°C, with an average of rainfall of about 60.61 mm / month. The peak of the rainy season occurs between October and December [11]. The recorded rainfall data from the Climate Station in Batu Busuk shows that the average annual rainfall in this basin is about 3,582 mm, and the highest in 2016 at about 4,549 mm [11].Land use in highland watersheds is dominated by protected forests and community-owned mixed gardens (parak). These parak are generally grown by highlanders with hard crops as the second source of their income after rice farming and home gardens.
near their settlements, such as *durio zibethinus, parkia speciosa, nephelium lappaceum*. Even in the last ten years, a number of community members have tried to cultivate cacao plants on the ground. Based on survey results of respondents, the average age about 45 years, where one-third of them (33%) have lived there since they were born. Approximately 36% of households are migrants from outside the upstream areas who move there after marriage. In general, nearly 50% of them have lived in this upstream area for more than 40 years. In the context of livelihood strategies for their daily life, 26.7% of households have a high dependence on upstream farming, 67% of households rely on dry land and upland rice fields. Almost all households mentioned that they have *durio zibethinus, parkia speciosa, nephelium lappaceum* in their home gardens and *parak*.

The upstream of Batang Kuranji river catchment area is a protected forest area. The results of interview showed the forest cover degradation in upstream catchment areas has reduced, this has threatened the sustainability of their agricultural activities downstream. For the past 10 years, local residents have assumed that high rainfall in the upstream during the rainy season will cause erosion and flooding in their fields. Local community feel safe to cultivate their fields in the dry season rather than the rainy season. The high flow of water rainfall that suddenly causes floods from the hills often resulting in landslides in several locations.

Based on a survey of 30 respondents, 3.3% of respondents said landslides often occur around their residential location, 86% of them said the occurrence sometimes is not frequent, and the rest says it rarely happens (Figure 2). Key informants interviewed have also reinforced the problem of floods and landslides in this area. Accordingly, all this is closely related to the development of massive timber exploitation in the upper reaches in the 80-90s. Data obtained using semi-structured questionnaire with the criteria of respondents, namely people who live and have field (parak) in the upstream area.
The data of respondents from the questionnaire showed (50%) stated that there is still considerable commercial timber available in protected forest areas (Figure 3). Furthermore, the majority of respondents (66%) also stated that timber trees that are still available in protected forests are mostly of a diameter of 40-70cm. Only 7% of respondents stated that there were still trees with diameters greater than 100cm. Types of wood trees that exist in these forest areas are *pterospermum javanicum*, *mahony*, *swietenia mahagoni*, and *parashorea aptera*. Currently, public awareness of land cover conditions in upstream areas is higher than five years before. The mix-garden (*parak*) has begun with the conception of agro-forestry, where existing wood species are preserved or newly planted. The upstream area is one of the areas that need conservation, one of them with reforestation to increase the ability to withstand runoff. A conservation area is a recommendation to reduce the risk of flood disaster and erosion is Limau Manih, hillside, Gunung Sarik, Kuranji and Lubuk Minturun.

![Timber trees diameter](image)

**Figure 3.** Commercial Timber Availability on Upstream

The Community Forestry Group, established in 2016, will be the main platform for communities in the upstream watershed of Batang Kuranji watershed to contribute to conserving forests, preventing illegal logging models while ensuring better local livelihoods. To date, only 16.7% of respondents have received training related to Community Forestry Group activities, 83.3% of respondents stated that they have not studied or even know much about the activities of this group (Figure 4).

![Community Participation on Upstream Area](image)

**Figure 4.** Community Participation on Upstream Area for Community Forestry Training Group
upper river basin area Kuranji stems of the last few years are often submerged due to landslides. In addition, the increasing rainfall that suddenly caused flash flood from the hills. This makes the occurrence of erosion of mud accompanied by water from the slope of the hill in the upstream area of Batu Busuk village. As a result, the business of horticulture farms such as chilli was affected and damaged. Key informants mentioned that the upstream ecosystem in the protected forest area is still good but in the slopes a road is being built to connect the village on the hill, so it is that if there is high rainfall intensity it will be directly causing floods that hit the upstream areas especially affected paddy fields and cultivated areas under the slope of the hill. Then the problem that occurred from the issue of flash flood in 2012 is the average society still not care about the environment as it is throwing household waste into the rivers. So there is a blockage in the primary channels of the river flow from upstream to the middle and downstream areas.

3.4 Public Perspective in Middlestream Area

The central area of the Kuranji watershed is located in Batang Kuranji sub-district where the river flow includes five villages namely Kuranji, Korong Gadang, Kalumbuk, Laweh and Surau Gadang, Gurun Laweh. Types of livelihoods are farmers to employees. In the next section the author will describe kind of public activities in middlestream area.

3.4.1 Public Activities

The middlestream area of the Batang Kuranji watershed is a vital area for maintaining the ecosystem balance. Community activities that utilize the central area watershed will have an impact on the community in its middle and downstream areas. Community activities are in the middle of watersheds identified are agriculture, illegal logging, factory industry of beverage packaging, land clearing for housing and sand mining into activities that affect the balance of watershed ecosystems.

The middle area of Batang Kuranji wareshed is mainly planted with paddy fields 2-3 times in a year. Agricultural activities are mostly done by farmers of Surau Gadang and Laweh Gurun. Farmers in these two regions simultaneously cultivate paddy field. To ensure all farmers obtain the water equally, community make the regulations by Farmers Water User (Perkumpulan Petani Pengguna Air/ P3A). The land in both urban villages is difficult to be planted horticulture commodities. Because when rains is difficult to dispose of excess water in their farms. It were because of flat topography relatively, land use and poor drainage. The condition of the middle area has worsened, especially agricultural activities that require a lot of water at the beginning of the planting period. The industry which built in the middle adding a series of existing activities. Construction of factories that began with the reasons to build a pond has now continued and changed with the drinking water industry. The development of factory industry will obviously add problems that occur in the middle of the watershed and also changed water. Other activities are include land conversion for illegal housing and mining of sand. Land clearing created new problems. Based on respondents data the quality of water flowing through the Batang Kuranji watershed after the housing construction can no longer be used directly for bathing or washing the face. This is because the colour and smell of water has changed, it was not as clear as before.

3.4.2 Problem of Middlestream area of Batang Kuranji Watershed

Heterogeneity of activities and interest in the middle of Batang Kuranji watershed causes obstacles both environment and society. These include changes in the quality and quantity of water resources, making accusations between upstream and central areas, rivers and irrigation networks as dump trucks, mutual cooperation in the maintenance of irrigation networks began to fade, unfair water distribution, and irrigation network conditions which is not yet environmentally friendly. Then, there was no integration of water resource utilization and disaster mitigation system and the land use change into residential areas.
The quality of water resources in the middle area is flowing down progressively. This is evident from the change of colour and its smell—the water that flows through the middle of this region is black and has an unpleasant smell. While from the side of quantity, the water that flows the middle area of Batang Kuranji watershed is used for many fields and wells of citizens. Batang Kuranji watershed as a source of water for household and agricultural needs is unable to meet that need again today. Increasingly reduced water supply for agriculture and unfavourable water quality flowing into the paddy fields makes this a problem that must be solved. Other problems arising due to rivers and irrigation networks as garbage dumps. These problems cause a sustainable impact on the environment and socioeconomic communities. Waste discharged into rivers and irrigation networks will lead to accumulation of waste in the upstream to downstream areas. So some of the garbage carried will be a source of disaster for the people in the middle and downstream more main stream adding by industry waste activities. So this raises a new problem for the community that is the conflict of mutual accusation between society.

3.5 Public Perspective in Downstream Area

The downstream area of the Kuranji watershed area located in the district of Padang Utara. This area is generally crowded by residential and commercial areas. The total area is 1.12 Km² for its own downstream area on its right is the West Air Tawar village.

The downstream part of the Batang Kuranji watershed starts from the back of the Basko Hotel towards the estuary of the sea. Throughout this region, a "canal flood" has been built to anticipate flooding which has resulted in the erosion of the river bank. In addition, there are two connecting bridges and one train bridge. On the edge of the canal river there are residential areas and also various kinds of human activities.

The conditions in this section are strongly influenced by human activities. Watercolour changes that occur in downstream hence can know the quality of water flowing from upstream to downstream. Where the water that flows down to downstream is no longer as clear as water upstream. The colour of blackened water more dominates. Meanwhile, the water will meet directly at the sea. In the downstream area of the Kuranji watershed no longer exists mangrove forest. In addition, this area also does not have agricultural land as in the middle and upstream areas. The average community livelihoods in this area are as fishermen and traders.

3.6 Problem of Downstream area of Batang Kuranji Watershed

The more diverse community activities downstream area of Batang Kuranji watershed is added environmental problems and social communities increased. Some problems arising from the various activities that occur in the downstream area of Batang Kuranji watersheds such as floods, waste piles, fish catch decreased, loss of mangrove forest area, sedimentation of Batang Kuranji watershed, an damage to the Batang Kuranji watershed area every year, and the absence of river basin management mechanism. Flood disasters are a problem occurring almost every year in the downstream area of Batang Kuranji watershed. A large water discharge during the unstoppable rainy season will directly inundate most of the downstream area. The rising sea level that coincides with the arrival of water from upstream and central areas further exacerbates this situation. Since the great flood in 1989, the city government tried to find help to overcome the problem. Finally, in 1990 the canalization of watersheds from Japan for the entire river area in West Sumatera. Until now the floods in the downstream region always occur every year but not as severe as previous years (key informant).

The floods which occurred each year is reaching 4 meters to meet the flood canals that have been made. At the time of this research survey conducted high water level that seemed to meet ¾ part of the canal flood that has been built. It is suspected that the flood problem occurring in every year is not only caused by community activities in upstream areas but also in the middle and downstream areas. Large water flows and floods that occur every year not only harm the community. Large direct water currents will also carry sand or soil particles from upstream to downstream. The dam function did not work properly barrier rock or wood forest that flowing from upstream. If this process occurs
continuously will appear deposition of sand or soil called sedimentation. Some community members in the downstream section work as fishermen. The or catch was more when pre-construction of canal flood because fish and another marine biota still often appeared in the watershed area. The problem today felt difference by the fishermen after the river basin development is the difficulty of getting enough catches to meet the economic needs of the fishing communities. This is causing some fishermen to switch their livelihoods. Many of fishermen have to catch fish in the ocean area further away from the downstream area of watershed. This is different compared to before the canal was built when fishermen could catch the fish in the watershed area alone without having to go to sea.

The development of a flood canal project that aims to reduce the risk of floods received by the community requires clearing land in the downstream area of the Batang Kuranji watershed. So that causes some of the mangrove forest area downstream area is cut down. The loss of part of the mangrove forest area in this area causes the balance of the downstream ecosystem downstream. Some marine organisms that live in symbiosis with mangroves or mangrove trees to be moved to choose an area that suits their required habitat. This lost mangrove forest area needs to be the government's attention.

Complicated problems in the downstream area of this Kuranji watershed. ranging from floods, garbage, and sedimentation and also more worrying to some people in this area is the degradation of land that they occupy today. This is felt by the people who live near the canals. The respondents said that almost every year the surface of this land dropped approximately 2 - 4 cm. They felt a deeper gap was forming downstream at the end near the sea area. This is a concern for some people. However, there has been no special attention from the local government. The problems along the river basin are holistic, multi-functionality of river basin, a different interest that encourages conflict, all parties needed to manage conflict, uncertainty alternative and result because of disregard the decision process, the meaning is law not beyond criticism [12].

Watershed management is needed for the realization of clean and safe river basins. The current problem that is felt by some people in the downstream area of Batang Kuranji watershed that was absence of comprehensive watershed management. So this creates new problems that keep popping up in the downstream area. For example, currently, the water flowing downstream is black and brown. this proves that in the upstream and central areas and some downstream areas still occur waste disposal in randomly to the city either household waste or industry. This waste disposal is not yet well-managed. So this causes losses in the downstream community.

Problems that occur in downstream areas of Batang Kuranji watershed needs to be a concern for the community and government and the private sector. In the conditions that occur as now, it is supposed to downstream part of watershed done improvements both physical buildings and governance. But it was very unfortunate. Until now, the city government of Padang itself has not done much for this area. It is required that the rules are comprehensive and capable of coordinating all parties involved in handling the Kuranji river basin as common pool resource. Regarding resolving water damage, synergy is needed between regions in the form of role-sharing between the Province, district sub-district, and or villages at upstream and downstream areas. Handayani (2013) argued integrated watershed management should keep attention to the relationship between a sector with the activities sector to water supply because its component will affect the other sectors [13].

Various methods can be applied to conflict resolution efforts in river basin basins, especially as irrigation problems can be solved by analytic hierarchical model. The model is utilized along the river by involving the farmers on data assessment [14]. Furthermore, for conflicts resolution that involving many parties, it is necessary to do various stages of compromise to reach an agreement whereby one party receives compensation for the achievement of conflict resolution. Integrative conflict among conflicting users by adding mediator roles. The resolution of conflicts within the natural resources in Indonesia could through mediation, reconciliation and negotiation which then establishes a communication forum in resolving disputes and or through arbitration if necessary [15]. No optimization participatory approach based on the IWRM and Dublin principle concept on river basin
Batang Kuranji issues becomes the preliminary information for decision makers to better maturing the rules and utilize platform and forums active in dealing with water resources issues.

Water resources have become common pool resources so many parties are involved and the challenges faced become more complex. Collective action among users are needed in the watershed system [15]. Kerr (2007) said that there are some aspects to support collective action are; (1) Natural resource in the commons pastures, forest, ponds, and groundwater is having high exclusions and subtract-ability. Encourage for collective action in micro-watershed scale, and implementation hydrological perspective for macro-watershed to suggested policy and practice (2) Collective action among users are needed in watershed system. (3). Coasian bargaining within parties involved for externality problems, command and control, or taxes, and subsidies can be used also. (4) Needed watershed governance clearly to institutional arrangements as a guide for effective management. (5) Watershed management challenges in developing countries are its cost and benefit distributed unevenly, conflicting uses, needed common good focused on technology. Keywords: uncertainty watershed management as a challenge participatory approach. (6). Clearly define boundaries, shared norms, past successful experiences, appropriate leaderships, interdependence among the group, heterogeneity of endowments but homogeneity of interest and low levels of poverty for reduce conflict in collective action experiences[16].

4. Conclusion
The conclusions of public perspective on the problem of Batang Kuranji Watershed are as follows:

(1) Public Perspective In Upstream Area
Local community in the upstream area revealed that the condition of the upstream area of Batang Kuranji is mostly good and also the vegetation. It is just a matter of household waste being thrown away in the river. So, the impact is felt by the downstream community. This is what makes the culverts blockage overflows.

(2) Public Perspective In Middlestream Area
Data and information provided that awareness and responsibility for waste control is a shared responsibility. There are forms of development that ignore environmental impacts and damage transfer of land functions that have an impact on the environment triggers conflicts between actors of interest with the community due to ignoring the characteristics of the land and the conditions of the local community. A clear integration and distribution of water use from upstream to downstream is needed.

(3) Public Perspective In Downstream Area
There are important issues that must be considered by both the local government, the community and the parties concerned in the downstream area of the Batang Kuranji watershed. The problems include floods that occur every year, piles of garbage, decreases in fish catches, loss of mangrove forests, sedimentation, loss of areas each year, and the absence of comprehensive watershed management.

Too late people realize water resources are a shared resource and by that time the problems are mounting. The current impact is still a lack of understanding of the public that water is to be an integral part of nature which is not separate within a single system. This is evident in the case of river basin water users against the problems faced today. There are parties involved and pollute and destroy the environment has not been dealt with firmly. To be concluded that the management of water resources Batang Kuranji is not in accordance with the principles of water use agreed to The world. The emphasis in participatory approaches has not been met as seen from the inadequacy of forums that bridge the problems faced by the community to be acted upon immediately by decision makers.

As stated in KLHK (2017) the occurrence of water quality degradation of rivers due to pollution either liquid or solid waste without the treatment of waste processing, then the drainage and sanitation system that is still integrated also caused by the lack of attention of the parties environmental sustainability [17]. In general, the main problem of water quality degradation in Batang Kuranji watershed is caused by garbage and waste and land use activities that are not environmentally sound.
To achieve sustainability of watershed management 'user pays principle ' and ' polluter pays principle could be the right choice method [18]. On the other hand, four principal objectiveness by Agenda 21 (1992) can also be a reference for the creation of sustainable management of watershed [19]. In this case, developing a sense of owning, generating self-reliance among local communities, reducing the cost of implementing the project, and maintaining project achievement are some reasons to motivate people to participate in regional management Streams. Similar pattern approaches can also be explained to describe water quality and flood management that are water quantity aspect, community demands on water, infrastructure development, and linkage between water management and land [20].

5. Acknowledgment

Author would like to thank to the Graduate Program Andalas Universitas that financially support this study. This paper is a part of the study entitled “Membangun Model Pengelolaan DAS Berkelanjutan: Kasus DAS Kuranji, Padang”.

References

[1] Scheuman, Waltina. (2001). Freshwater Resources and Transboundary Rivers on the International Agenda: From UNCED to RIO+10. Deutsches institute fur Entwicklungs-politik Tulpenfeld, Bonn.
[2] Stalnacke, D., and Geoffrey Gooch. (2003) Integrated Scenario Analysis Wilayah Konservasi Daerah Aliran Sungai Indonesia. Pusat Penelitian dan Pengembangan Konservasi dan Rehabilitasi (P3KR), 2012
[3] Satriyo, Edi. (2015). Tantangan Pengelolaan Sumber Daya Air (PSDA) Sesudah dibatalkannya Undang-G-Undang RI No.7 Tahun 2004 Tentang Sumber Daya Air (UU SDA). Seminar Nasional Teknik Sipil V, 2015.
[4] Kerr, John. (2007). Watershed Management: Lessons from Common Property Theory. International Journal of the Commons. Igtiur, Utrecht Publishing & Archiving Services for JASC. Vol I, no 1 October, pp. 89-109
[5] Helmi, 2003. Aspek Pengelolaan Terpadu Sumberdaya Air (Integrated Water Resources Management) dalam Pembaharuan Kebijakan Menuju Pengelolaan Air yang berkelanjutan di Indonesia. PSI-SDALP, Padang
[6] Pahl Wostl, C. 2006 The implications of complexity for integrated resources management. Institute of Environmental Systems Research, University of Osnabrüt, Germany
[7] Annual Report 2005-2006 Associated Programme on Flood Management (APFM). http://www.floodmanagement.info/about/reports/APFM_2005_2006_Annual_Report.pdf Accessed October 03, 2018
[8] Undang-undang No 7 tahun 2004. Tentang Sumber Daya Air. https://www.gwp.org/globalassets/global/gwp-sea_files/2004_indonesia--wr--law----uu-no.-7-2004-sda-lengkap.pdf
[9] Paimin, et, al. (2012). Sistem Perencanaan Pengelolaan Daerah Aliran Sungai. Bogor, Indonesia : Pusat Penelitian dan Pengembangan Konservasi dan Rehabilitasi (P3KR), 2012
[10] Irsyad, Fadli and Ekaputra, Eri Gas. (2015). Analisis Wilayah Konservasi Daerah Aliran Sungai (DAS) Kuranji dengan Aplikasi SWAT. Jurnal Teknologi Pertanian Andalas Vol 19, no. 1 Maret
[11] http://www.psvd.asalprov.go.id, Accessed September 03, 2018
[12] Moster, E. (1999) Perspective on River Basin Management. RBA Centre for Comparative Studies on River Basin Administration, Analysis and Management, Delft University of Technology, Stevinweg 1, Netherlands. Vol. 24, no. 6, pp. 563-569,
[13] Handayani, Gusti Ayu K.R. (2013). Urgency of Regulatory Priorities Watershed in Order to Conduct Integrated Watershed Administrative Law in Indonesia. The First International Conference on Law, Bussiness and Government UBL, Indonesia
[14] Febriamansyah, Rudy. (2018). The Use of AHP (Analytic Hierarchy Process) Method for Irrigation Water Allocation in A Small River Basin (Case Study in Tampo River Basin in West Sumatera, Indonesia). Retrieved from https://pdfs.semanticscholar.org/ad94/6e771b603758afe19157af3d037b44b84898.pdf

[15] Konsep integrated water resources management (IWRM)/Pengelolaan Sumber Air Terpadu. (n.d) Retrieved, May 15, 2018. https://simdos.unud.ac.id/uploads/file_pengabdian_dir/fbb4415cd4e92f8976e0d4f40044396f.pdf

[16] Kerr, John. (2007). Watershed Management: Lessons from Common Property Theory. International Journal of the Commons. Igtiur, Utrecth Publishing & Archiving Services for IASC. Vol I, no I October, pp. 89-109

[17] Petunjuk Teknis Restorasi Kualitas Air Sungai. 2017. Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia

[18] Effendi E. (2010). Kajian Model Pengelolaan Daerah Aliran Sungai (DAS) Terpadu. Retrieved from http://bappenas.go.id

[19] United Nations Sustainable Development. United Nations Conference on Environment & Development Rio de Janerio, Brazil, 3 to 14 June 1992. A/CONF.151/26/Rev.I/Vol.I: Agenda 21 of the United Nations Conference on Environment and Development Accessed. August 01, 2017

[20] https://www.adb.org Accessed November 17, 2018