

Role of Serious Games in enriching Watershed Conservation Manoeuvres

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doi: <https://doi.org/10.21467/proceedings.114.54>

Abstract

Watershed management is important for sustainable development. But now because of lack of education, faulty practices and other uncertain factors, watersheds are deteriorating and that needs to be checked. Already, lots of government/non-government projects and are going on in that direction. Serious games or educational games are also being used as a tool to teach watershed conservation. This paper brings out the importance of serious games in the enriching of watershed conservation activities. How these games can solve various issues regarding watershed management and can bring about coherence in authorities and stakeholders to work together. In this paper, we will evaluate a few games about how they help to enhance knowledge among individuals, teach them good practices about watershed conservation and refrain them from using their ongoing wrong practices that have the potential to harm them and their surroundings in the long term.

Keywords: Serious Games, watershed management, stakeholders

1 Introduction

Watersheds are the areas where water from rainfall or snow drains into a single location like a lake or a stream. These watersheds are responsible for providing the required water for irrigation purposes, drinking water, and provide a home for a wide variety of wildlife and plants. These watersheds contribute a lot towards sustainable development and hence need to be conserved as they are vital for all living organisms. But, various factors like surface runoff, soil erosion, pollution, over exploitation of available water by wrong agricultural practices or otherwise etc. are effecting the health of these watersheds badly and hence endangering sustainable development. This is also reflected in an increasingly low level of groundwater, which is harmful for everyone.

The main causes of this deterioration of watersheds are generally regional. Most of the times, the causes are lack of education to the people living the region in keeping their watershed healthy and hence over exploitation of available resources which proves to be damaging in the upcoming years. But due to lack of knowledge, they are unable to foresee the problems that they may face in the upcoming years due to that. Other causes include wrong management decisions regarding the watersheds or in other words, authorities taking decisions that are not in coherence with the local individuals and hence causing conflicts among them.

This paper brings forward the role that serious games can play in tackling these issues regarding the deterioration of watersheds. Serious games are the games whose objective is education rather than sheer entertainment. Serious games have the potential to educate someone about a particular scenario even if they have little background knowledge about that. Serious games are being widely used everywhere now-a-days in many different fields where otherwise games were not possible only to make understanding those things more engaging and effective. In context of watershed conservation, serious games can do wonders



in terms of providing education to stakeholders, bringing authorities and stakeholders in coherence and therefore contribute to effective decision-making.

2 Problems in watershed conservation works

As a result of changing demographics, public expectations, political power bases and understanding of natural systems, it is becoming more and more difficult to carry out Natural resource management [1]. There are a lot of uncertainties in context of natural resource management because in context of the existing forest management practices and other natural resource management practices, the long-term effects are unknown. Also, other factors like the impacts of changing societal values and expectations in natural resource management, impacts of changes that are occurring due to global warming are unknown. Watershed managers are confronted with a number of major challenges in decision making.

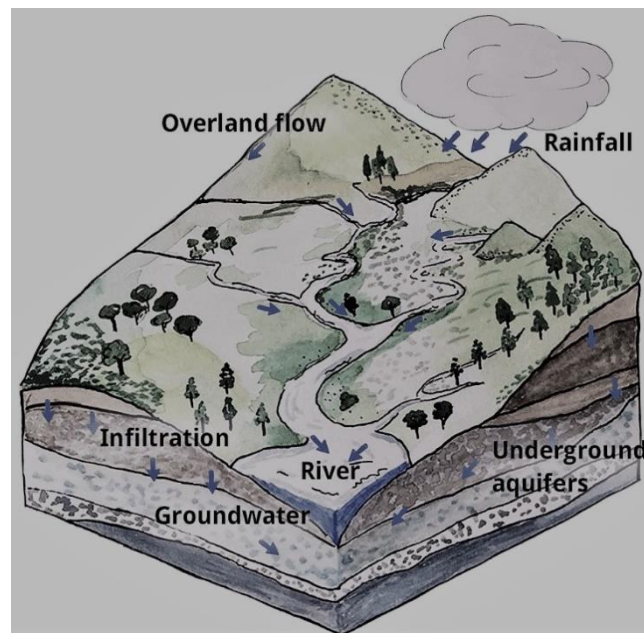


Fig 1. Components of a watershed

In Asian countries, 65% of the total rural population lives and earns a living in rainwater catchment areas [2]. There already exist watershed management authorities and agencies for the conservation of soil, but the actual stewards of the land are the villagers and the smallholders. These people are usually affected by poverty and are deficient in proper technology. Also, their quest for arable land, forage and food has far-reaching implications for the water resources and land resources. Because of increase in animal and human population and hence increased demand of natural resources, environment is constantly degrading as scarcity of forest and arable land is on a rise because of more pressure on less resources.

While the extent of watershed degradation has not been accurately measured, it is evident in many ways, as now a-days, amounts of agricultural produces have decreased, forests are being cut at an alarming rate, soil erosion is on a rise, underground water level is also going down wherever not recharged. Such factors put sustainable development in jeopardy. It is preferable to understand and treat the problems related to watersheds in the context of physical planning units defined by the direction and speed water flow. That is why, ridge to valley based approach is suggested to deal with watershed problems. All watersheds differ in their size and environment around them. So, different watersheds must not be treated in the same manner as they would react differently to watershed conservation activities because of these differences.

In the Asia, the steeper upper watersheds were predominantly wooded in a natural manner. But, there has been over-exploitation of these watersheds for wood, fuel and forage. The result is that forests are severely degraded in certain areas. While in others, they no longer exist. Trees are known to help stop runoff, but with degradation of these watersheds and decrease in number of forests, soil erosion is also not checked and it further weakens the watersheds.

Also, the Depositing of eroded materials and soil into agricultural fields and lakes is a crucial management challenge which needs to be addressed as sedimentation proves to be very costly affair.

Excessive surface runoff results in flash flooding, which reduces temporary storage of water in the soil profile and ground water aquifers. During the dry season, a part of this stored water would normally return to surface water and contribute to streamflow. But declining river flow during the dry season has a serious impact on downstream uses for electricity, agriculture and water supplies in houses.

3 Serious Games

Gamification refers to the application of game elements to off-game scenarios in order to engage the users through a highly interactive platform. In layman's terms, Serious Games make an attempt to make the players understand a certain situation while treating it as a playable game rather than a real life challenge with the users being game players themselves rather than stakeholders [3]. There is a game called *My Marriott Hotel*, designed by a company Marriott International [4]. They use this game to recruit new comers to their company. In this game, candidates are made to manage a virtual hotel of their own. They earn points according to the way they perform tasks like training their employees, designing of their restaurant, choosing the menu for food items, buying useful items for the hotel, serving their guests etc. Hence, a non-game activity has been converted into a game. Other Examples of serious games can be the star ratings that are given to sellers and buyers on ebay, the progress bars by companies like PayPal to keep their users motivated to complete specific tasks and many more such examples can be seen now a-days [5]. The purpose of Gamification may or may not be education only. But when we gamify a certain situation with a sole objective of education or providing training or knowledge about something that might be difficult to understand otherwise, then we call them Serious Games. Such games have a tendency to educate the user by playing about a certain thing. Serious games include rewards and badges which keeps users motivated.



Fig 2. Serious Games

Serious games encompass all facets of education i.e. information, training and teaching [6]. The playful experiences provided by serious games make learning easier as non-game scenarios are made more engaging and motivating through games. Increasing levels of difficulty in games help the players to deal with complex

situations. Receiving badges and rewards motivates the gamers to perform better each time. Games can also include sharing of certain virtual game elements or rewards with other game users hence increasing social interaction among users. Rewarding also brings out creative side of the user in solving particular problem or for crossing a certain milestone hence bringing out new ideas and methods to do the same work. Working in teams to reach to a certain goal helps in building collective decision making and a feeling of trust among the users.

Serious games can be helpful in providing early knowledge about scenarios where it may not be feasible to directly working in the real environment without any previous expertise. Learning about something difficult like a complex machine, driving a train, flying a plane on a virtual real like environment can be very helpful as practically we don't have these much resources to practice as many times as we want. Practising and familiarising through a virtual platform also reduces cost to a large extent, along with ensuring safety of employees working in extreme conditions such as in factories containing harmful chemicals.

We can get examples of serious games in nearly every sector, such as in healthcare for engaging cancer patients during the very difficult chemotherapy sessions so that they may get some relief from their pain with the help of engagement towards the game. Serious games can also be seen in the training of employees at water treatment plants or any such large factories where familiarisation with those huge machines before even physically going there proves to be very much beneficial.

4 Serious Games for Watershed Conservation

After knowing the benefits of serious gaming in such vast applications, it makes sense to try to address the issues related to watershed management and agriculture by the use of serious games. As we have discussed earlier, the stakeholders and decision makers in this case are mainly smallholders or the residents of that region. It is not possible for them to have proper knowledge about correct usage of natural resources available to them as they cannot foresee the impacts of their natural resources management practices on their lives, on the agricultural land and on the underground water level.

Farmers are generally not that educated to know how correct their farming practices are and whether or not they harm the environment around them. They can be made to understand farming practices, less exploitation of water, recharge of underground water with the help of engaging environment of serious games.

With the help of serious gaming, we can involve stakeholders to play it out and then plan accordingly the manoeuvres that they wish to perform on their farms. We can make them change the way they carry out their activities using engaging environments along with producing best results. Keeping this in mind, several organisations took it upon themselves to create games having learning element and message of persuasion along with it. This is very much needed for the sustainable development as a whole.

The issues related to watershed conservation are often regional. Hence, for the solutions to watershed conservation, long-term planning at various levels of governance is required at local levels as well as at higher levels. All need to work in coherence. By making government officials and stakeholders share a same gaming platform to solve a particular problem, decision making can be made easy and there is a possibility they all the stakeholders agree upon a common decision and work together towards watershed conservation [7].

Why watershed management is such an issue is evident from the fact that the impact of human activities on natural resources is uncertain. Serious games can have the stakeholders to play it out and try different ways of doing the same task, without knowing the scientific reasons of the impacts. But after playing regularly, even if a person does not understand science behind what he is doing, he can still know which

watershed conservation practices will be more fruitful to them as the game they played did the scientific evaluation for them and displayed their results accordingly.

It is always better to visualize something than to just dictate it to someone. Games directly affect the mind-set of the player. If stakeholders are shown the benefits of their water conservation activities in the form of a game, it will have a long lasting effect on their mind. From examples of games like Sincity, where the user is made the mayor of the city. Now he has to plan and manage everything for the city, take decisions and see how his decisions work towards the development of the city. The user can analyse his mistakes and his good works through the medium of this game. Same can be done in case of watershed management works, where each individual may be made aware of these practices through serious gaming.

Gomes et al [8] presents a game based approach for capacity building by including role play activities for local residents to address the issue of depletion of drinking water in that area. This game would help local people to examine their problems using a visual medium. This game is evidently limited by the laws of nature although, it is possible to play with that too because of uncertainty, data insufficiency and the lack of understanding. This game has revealed the dynamic character of the water related problems resulting from urbanization.

Deborah et al [3] presented a case study of a Serious Games based tournament focused on a watershed built along Cedar river known as Cedar watershed. Participants of the tournament were local residents only. They were distributed in teams and were made to choose appropriate adaptive options for various scenarios of watershed conservation in relation to budget, time constraints, state and municipal regulations and technical aspects using their own knowledge and competence. The benefits that participants gained through this tournament were:

They learnt about other people's views regarding watershed conservation, mitigation from floods and droughts and also came to know about new watershed conservation activities. Had discussions about potential collaborations and projects in future. They made several new contacts there who could prove useful to them in their personal agricultural activities. When participants were asked again after three months of the tournament, 62% of the participants had started working on collaborative projects and 75% were able to find collaborations to co-ordinate their efforts with other organizations.

5 Conclusions and Future Scope

From the above discussion, we can conclude that serious games can do wonders in educating about anyone about scenarios which they otherwise may not be able to understand. The factors like rewards, badges, interactive gameplay make the games more engaging and hence having a deeper impact on the user playing it. Therefore, in fields like watershed conservation, games prove to be highly beneficial in solving problems related to depletion of its resources. Even civilians living in these watershed areas can be made to understand beneficial water conservation and natural resource conservation activities and they can be made to work together towards sustainable development. One point should be kept in mind that the way the game is designed to work decides a lot about how much impact it will have on the minds of the persons playing it. Inclusion of proper game elements to increase engagement will enhance the productivity/output of the game and it will be able to educate more people. So, understanding the mind-set of the users for whom the game is designed is important.

Considering the impacts that these serious games have on the individuals playing them, in future, we can see a lot more such game being developed related to watershed conservation works in order to bring more and more collaboration and coherence among the stakeholders for carrying out water conservation activities. The potential of serious games to bring about visible changes in lives of people make them an important asset in the times ahead for natural resource conservation education.

6 Acknowledgment

I would like to express my gratitude to Dr. Girish Pujar from N.R.S.C., Hyderabad for guiding me in this direction of watershed conservation works. I would also like to extend my appreciation to Dr. Arun Khosla for helping me in every way possible and inspiring me to write this review.

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