

論文内容の要旨

The increased levels of water pollution and declining water quality have greatly affected water resources, which are a major source of ecosystem services. Industrialization, population growth and urbanization have been linked to the increased water pollution levels, which are in turn decreasing the potential of water resources. The protection and restoration of these resources require an evaluation of the people's behaviour, attitudes and the value placed on the restoration of such services. This is because of the huge external costs caused by water pollution. These costs include direct costs such as the loss of lives because of water pollution related diseases, illnesses resulting from water pollution, death of aquatic animals among others. Indirect costs such as time lost from school or work, costs of rehabilitation diminished economic productivity and a toppled economy overall as the resources are geared towards the health sector as opposed to development. Kenya is no different and its classification as a water scarce coupled with poor sanitary conditions in the country exacerbates the water problem. This presents strong motivations for finding tailored solutions in the country to manage the scarce water resources and ensure clean water is accessible for use by everyone.

The reliance of a country's own natural resources is a viable option when attempting to find local suitable solutions to address local issues. For example, the use of locally available natural materials such as cactus, plant seeds, and minerals such as diatomaceous Earth that is mined cheaply and locally in treating wastewater to avert water pollution, has been proven to save costs and enhance accessibility and use of technologies that use them as raw materials. The use of diatomaceous earth is thus an alternative to commercially available materials such as activated carbon in mitigating environmental pollution. The adoption of such technology however requires adequate dissemination of information, cooperation among stakeholders and collective action from the government to the public. To achieve this, the issue of water pollution should be dissected from a risk management perspective. This involves understanding the public's risk perception, factors that influence their perception, knowledge and awareness on water pollution issues, the people's willingness and determination to take action through systems such as payment vehicles and voluntary activities linked to health concerns in affected regions. To develop a holistic view of the effects of water pollution this study sought to investigate empirical issues associated with risk perception and the consequent drive to take action among the affected communities while making financial considerations.

One of the major reasons behind the absence of adequate water treatment facilities and regulations in

developing countries is the lack of finances available for funding infrastructure that can regulate water pollution. This in turn leads to environmental and human health costs, which results to higher economic implications of water pollution. For example, it is estimated that around \$7.3 million is spent on healthcare for waterborne diseases alone in the world. Furthermore, large amounts of money are lost due to the deteriorating health of a country's population with many citizens unable to attend school or work due to health issues. To cut down on the economic costs there is need for affordable cost effective, suitable solutions. This involves the reliance of natural resources in developing countries to avert the wastewater menace. The use of local resources reduces the burden of importing wastewater treatment material thus cutting down on the cost of water treatments. Furthermore, reliance of naturally available materials avails the technologies and materials easily to the users thus cutting down of time and cost among other benefits. Thus there is a need to make economic feasibility analyses to help indicate the financial effects of water pollution and the cost aversion that would occur should better water management policy be put in place. These research goals was operationalized in three studies that employed both qualitative and quantitative approaches and economic models to analyse the cost implications of suitable technology adoption.

Study 1 evaluated the differences between risk predictors and risk perception regarding water pollution. Specifically, it focused on the differences in risk perception between factory workers and lay people situated in textile industries near the River Sosiani in Eldoret, Kenya. The lay people were divided into two groups. The respondents living downstream situated mostly in town centers and at the mid/lower parts of the river, and the respondents living upstream mainly found at the upper parts of the River Sosiani. Data were obtained from 246 participants using questionnaires. Several factors influencing risk perception were selected to evaluate the degree of perceived risk amongst the groups. Descriptive statistics mean score and correlation analyses, and multiple linear regression models were used to analyse the data. The one-way ANOVA results showed statistically different levels of risk perceptions amongst the groups. The partial and bivariate correlation analyses revealed the differences in scientific knowledge between respondents upstream and downstream. The multiple linear regression analysis showed that each group used different variables to determine risks in the region. In the factory group, 56.1% of the variance in risk perception is significantly predicted by sensorial factors, trust in the government's capacity to manage water pollution and the impact of water pollution on human health. About 65.9% of the variance in risk perception of the downstream inhabitants is significantly predicted by sensorial factors, the possibility of industries generating water pollution, and previous experience with water pollution. For the respondents located upstream, age, sensorial factors, trust in the government and the possibility of being impacted by water pollution factors significantly

predicted 37.05% of the variance in risk perception. These findings indicate that enhanced public participation in water governance amongst the residents of Eldoret town is needed, along with an understanding of the different characteristics of the respondents in the region during risk communication. This will boost awareness in the region and promote the adoption of better practices to minimise the adverse effects of water pollution faced by the region.

Study 2 examined the willingness to pay for and participate in volunteer activities for the restoration of the Sosiani River in Eldoret, Kenya. The willingness to pay was examined through two scenarios that differed in the organizations conducting the proposed project i.e. the government and non-governmental organizations. The study focused on factory workers situated in textile industries and lay people living in the area, who were divided into two groups: respondents living downstream, who are situated mostly in town centers and at the mid/lower parts of the river and the respondents living upstream, mainly found at the upper parts of the River Sosiani. The study employed the double-hurdle model to identify the factors that influence the willingness to pay (WTP) for improved water quality in the area. An ordinal regression model was used to analyze the willingness to participate and its influencing factors. The results of the study showed that an average of 74.4% of the 279 respondents studied were willing to pay for river restoration in the area. The mean willingness to pay for the government proposed scenario was Ksh 182.51 (1.66\$) per household/month and Ksh 169.28 (1.54\$) per household/month for a non-governmental proposed project. Within the groups, upstream and downstream inhabitants had higher mean scores for a non-government project as compared to a government project, while the reverse was observed in the factory group. The empirical results of this study showed that risk perception, trust and sociodemographic variables were significant factors on the stated amount and the decision to participate of the respondents. The characteristics of respondents with zero WTP, who comprised a significant amount of the respondents (25.6%), was also analyzed in depth, shaping the recommendations of the study. The empirical results showed that the number of years lived in the community was a major determinant on the willingness to participate and pay for environmental restoration projects in the area. The results of the study could influence decision makers in general and have potential implications that could be applied in other sectors not necessarily related to water issues.

Study 3 analyzes the cost implications of technological adoption through explicit cost breakdown of environmental restoration projects coupled with averted costs incurred if the situation is left unchecked. This is achieved through developing two models. Model one analyzes the costs of using diatomaceous earth for the treatment of wastewater specifically textile wastewater and makes comparisons to commercially available

activated carbon that is commonly used. The second model analyzes the effects of water pollution in the study area through the cost of treating illness that arise from water pollution. The results of the second analyses are treated as potential benefits that would be incurred from the project. The benefit cost ratio of the two models is further analyzed with promising results as follows: the BCR (benefit cost ratio) for diatomaceous earth was above 1 in all the three diseases in the region. This indicates that in the treatment costs of diarrhea, amoebiasis and bacterial infection the benefits of utilizing the material would be 1.3, 1.7, and 2.4 times the costs respectively thus a feasible choice. Through employing the proposed and existing models to estimate the cost of direct damages to human resources caused by water pollution results in actual numbers and figures presentable to accountants, financial organizations and the government for consideration when making decisions. These figures and numbers could help the government and other authoritative bodies to impose tax and fees on polluters thus establishing green accounting while keeping accurate financial statements for interested parties.

Keywords: public participation; risk perception; willingness to pay; willingness to participate;