

The River Of Life, Its Importance, And Conservation- A Case Study Of The Qawa River In Vanua Levu, Fiji Islands

Ravinesh Rohit Prasad¹, Mohammad Afsar Alam² & Sakul Kundra³

¹Department of Social Sciences, College of Humanities and Education Fiji National University, E-mail: raviro281@gmail.com ORCID:0000-0002-5006-1173

²Department of Social Sciences, College of Humanities and Education Fiji National University, E-mail: drmaalam92@gmail.com ORCID:0000-0001-5989-6399

³Department of Social Sciences, College of Humanities and Education Fiji National University, E-mail: dr.sakulkundra@gmail.com ORCID:0000-0002-8250-8021

*Corresponding Author: - Ravinesh Rohit Prasad

Abstract

The Qawa River in Vanua Levu substantially influences local residents' quality of life. The river discharge from the sugar mill has long been a source of worry. In this study, the objectives were to investigate the river's relationship with the community, identify the government's role in river improvement, and explore the challenges in river management. In-depth interviews, surveys, and documentation were used to collect data. The findings indicated that the local community depended on the river for economic survival. Therefore, community participation becomes crucial for integrated and sustainable river management.

Keywords: stakeholders, management, legislation, livelihood, Qawa River, river conservation, Vanua Levu.

Introduction

There seems to be a global impact of water stress. In most affluent nations, river basin management has undergone a paradigm shift in the last few decades. Traditionally, the government or public organizations are solely in managing a river basin. But because water-related issues are becoming more complex and people are becoming more aware of environmental problems, many governmental rules on managing water resources now include provisions for stakeholder input. A sense of place and community may be fostered as a result of raising public knowledge of and participation in the rehabilitation of urban streams and watersheds (Chun et al., 2012).

The White River Watershed initiative in Vermont, United States, and the Hazel River Basin program of the European WFD are examples of river basin agendas inclusive of public participation. Williams looked at four case studies of how maintaining lakes in Australia has succeeded or failed due to community involvement. Several studies involve public participation in river management, such as river rehabilitation (Williams, 2002). Tantoh et al. (2018) contend that effective management of river basins depends on the participation of Community-Based Organizations (CBOs) in decision-making

processes and the backing of state-level efforts. It may be argued that river basin management necessitates a minimum of community. Without a sense of belonging, the various interests involved will only cooperate to the extent that they believe it to be in their best interests. When circumstances change, collaboration may crumble and need to be rebuilt from scratch (Mostert, 2017).

Power distribution and influences in the community are the core of many environmental challenges and development; a new approach, a participatory local appraisal, must be considered to address the environmental issues (Daim et al., 2012). Community-based river management is one strategy that might be used. The goal of this co-management between the community and local government is to actively involve the neighborhood in the development and management process during the planning and implementation phases (Widodo et al., 2010; Yogaswara, 2003). The active empowerment of the community to care about and participate in the development, implementation, and assessment of river-related initiatives is one way that the community can get involved in river management (Ananga et al., 2017; Apipalakul et al., 2015; Maryono, 2014). In the global South, community and participation are highly valued concepts in development rhetoric

and practice, particularly in the management of water resources. Water projects are anticipated to become more efficient and equitable as more people engage in the decision-making, implementation, and assessment processes. Community and participation are strongly ingrained in development discourses and practices in the global South. In contrast to government-led, technocratic water resource administration projects, there has been a shift toward more "participatory" and "community-based" water resource management activities in the rural water sector (Sultana, 2009).

A case of community involvement in watershed management in Nova Scotia is the locally based Clean Annapolis River Project (CARP). To involve residents, promote stewardship, and enhance watershed management, CARP is in a unique position to facilitate collaboration with numerous stakeholder groups, academia, the government, and local communities. The Annapolis River watershed local communities and CARP work together on environmental stewardship initiatives, including those that involve the agricultural sector. One of the most prevalent land uses in the watershed is agriculture. For numerous years, CARP has collaborated with farmers to put initiatives targeted at reducing the detrimental effects of farming on the ecology of the Annapolis River. Collaborations with other organizations, such as provincial government departments and non-governmental groups (such as Ducks Unlimited), have enabled CARP to deliver its agricultural stewardship programs more successfully by sharing resources and knowledge. According to Cliché and Freeman (2016), projects have thus far sought to lower the number of pollutants that agricultural runoff introduces into waterways, increase the quantity and quality of riparian buffers along shorelines, fence cattle out of waterways, and create farm stewardship agreements with local farmers and landowners.

Based on successful models from industrialized nations, water-related organizations in developing countries like Malaysia seek to emulate and adopt a similar approach to public engagement in river management (Rasagam & Chan, 2002). One such undertaking is a river restoration and management project, which tries to enhance local water quality and flood protection. To ensure that river water quality is at least second class, the Malaysian Government's Department of Irrigation and Drainage launched the "Love Our Rivers" and "One State, One River" campaigns across the nation in 2007. (Chun et al., 2012). According to

Angriani et al. 2019, the local community must be involved in the long-term management of the Kuin River in Indonesia. Participation is needed from the community living along the Kuin Riverbank, as well as formal figures (neighborhood leaders, village and district heads, and mayor), informal figures (society leaders, religious leaders, heads of community organizations, NGOs), law enforcers, people's representatives, and others. This demonstrates that preserving the river and its surroundings is the responsibility of everyone in the area, not just those who live along the river's banks.

In South Africa, community involvement means conducting conferences and open forums where residents can share their thoughts with elected authorities or non-governmental organizations working on advocacy campaigns (Nare et al., 2011). Communities can contribute significantly to water resource management challenges if given a chance. In Kalomo (Zambia), the local population was enlisted to manage the provision of water services, with residents fencing in a catchment area and routinely maintaining the water source. Gujarat (India) is an example of the connection between local community participation in water project management and stakeholder consent, predominantly by allowing them to negotiate with other stakeholders at a higher level about issues affecting their way of life and livelihood (Nare et al., 2011).

The Room for River project in the Netherlands focuses on early community involvement and cooperation across various governmental levels and organizations. One reason for delegating authority to regional governments was that these governments would be more adept at gaining community support and invoking less resistance. They are perceived to be more familiar with the local community than the national Rijkswaterstaat. Additionally, Room for the River has a gigantic communication office by Rijkswaterstaat standards to proactively inform and promote the program's communities (Rijke et al., 2012). Another example is the Lake Ontario-St. Lawrence River, where public meetings were critical in informing the public and stakeholders about the water system's needs and challenges and providing an opportunity for people to express their needs and concerns about any new lake-level operating policy. Participant involvement in developing operating plans increased their innovation and legitimacy, particularly when perceived to be backed up by sound science. Numerous participants appear to have developed a

greater awareness and understanding of the interests of other stakeholders (Carr, 2015). People worldwide are realizing that traditional approaches offer a variety of beneficial alternatives, which has led to a significant increase in research into customary and community-based marine resource management strategies in locations like Fiji. Traditional management techniques offer insightful information about other people's experiences since they are grounded in an empirical understanding of local natural and cultural systems. Because formal authority upholds traditional management agreements, it follows that protocols must be observed. People in Fijian communities are expected to respect and enforce tradition because of such communities' social structure and close-knit units. Social communication channels are regularly used to communicate collective decisions, ensuring everyone is informed. As a result, the current punishment system successfully secures compliance (Veitayaki, 2008).

Rivers in Fiji

In Fiji, the larger islands have the most abundant natural water resources and richness of freshwater, with annual rainfall ranging from 2,000 to 6,000 mm in highland catchments (SPC SOPAC, 2012). Fiji's various river systems rely on rainfall. These origins range from little mountain creeks and raging torrents to massive plains rivers. They meander between flood plains, lagoons, and oceans, with a bordering coral reef protecting them. Surface water serves as the primary source of water for all towns and major cities on the larger, mountainous islands of Fiji. This source serves both drinking and commercial needs (SPC SOPAC, 2012).

There are numerous vital rivers in Viti Levu. The Rewa (130 km), Navua, and Sigatoka Rivers are three of the island's largest river systems. They all flow into the sea along the south shore. The island is home to more than 50 rivers. The Rewa River has a sizable catchment area of 3092 km², draining about one-third of Viti Levu. With a combined catchment area of 15% of Viti Levu, the Ba and Nadi Rivers are located in the driest parts of the island. Even though there are 40 rivers on Vanua Levu, all of which are short in length, the Dreketi River, 55 km long, is the only notable river there (Fiji Department of Energy, 2010).

The Labasa, Wailevu, and Qawa Rivers, which all originate in Macuata province, pass through Vanua Levu. The delta formed by the confluence of these

three rivers is where the town of Labasa is located. An 8-kilometer canal that connects the Qawa and the Labasa River on the edge of Labasa Town helps to drain the fruitful Labasa plains and adjoining slopes (Gray, 1989). The Qawa River is roughly 33.5 kilometers long and drains a 126-square-kilometer region (Yeo, 2001). Its relative shallowness prevents any major vessels from passing through. Since Port Malau, Labasa's primary port, was built, this river's use for extensive shipping has reduced. The Labasa Delta is formed by the confluence of three rivers, the Labasa, the Qawa, and the Wailevu, which drain the fertile Labasa plains and neighboring foothills (SPREP, 2004). An extensive range of commercially significant fish, crabs, and other aquatic species use mangroves as breeding grounds. By anchoring sediments with their tangled roots, mangroves also aid in preventing soil erosion. The river also filters contaminants, which helps to maintain water quality and purity. They also play a vital part in the sewage management scheme in Labasa (Government of Fiji, 2017).

The Qawa River significantly impacts residents' lives, just like any other river. Numerous tiny towns and villages along the Qawa River rely on the river for food, transportation, recreation, and agriculture. River water is filtered and used when there is a shortage of tap water. The Qawa river flows through Labasa before entering the sea; it rises in the Macuata region of Vanua Levu's Northern Division. The Qawa River has long been a well-known and persistent source of pollution because of the Labasa sugar mill's discharge of waste and byproducts into the river. The Labasa sugar factory is under the management of the Fiji Sugar Corporation. Many people who use the Qawa river as a means of transportation and as a source of food have brought up the issue of river pollution, its severe impacts, and their concerns for their life and the river's natural resources, yet little appears to have changed. The Labasa sugar mill releases hazardous industrial waste into the river yearly without considering the consequences (Tuivanualevu, 2017).

Water management and conservation present significant challenges that no organization can fully address. Stakeholders (governments, the business sector, NGOs, and funding organizations) must cooperate for any policy to be executed. Any government-led community awareness project can benefit from incorporating such collaboration into action agendas and stakeholder partnership agreements, which can be created to encourage a

sense of commitment and accountability. These partnerships can support one another and sometimes pool limited resources for a shared goal (Kumar, 2010).

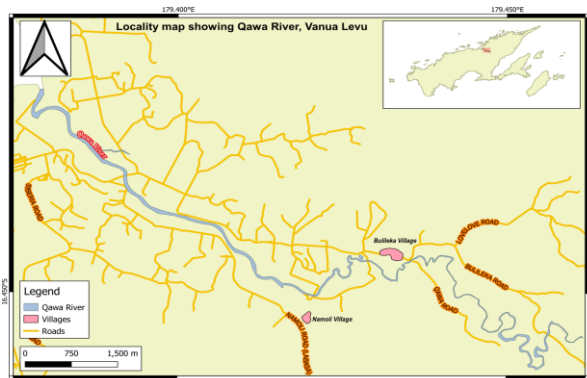


Figure 1. Location of the Qawa River
(Source: Ministry of Lands and Mineral Resources, 2021)

Community participation in water management

Creating a shared understanding and integrating it across scientists, citizens, and management organizations is the main problem in river management. Plans for growth in Fiji consider the need for watershed management initiatives to lessen flood frequency, soil erosion, and sedimentation of river systems (Fiji National Assessment Report, 2010). The Watershed Management Program concentrates on structural engineering methods such as retention and monitoring dams to control floodwaters' peak flow after heavy rainfall to decrease the effects of flooding in the lower river basin (SOPAC, 2007).

The Western and Northern Divisions, which include densely inhabited flood plains and all the critical infrastructure, have the worst-affected watersheds. These watersheds experience annual soil losses of 60 to 81 tonnes per hectare (Fiji National Assessment Report, 2010). The main structural improvement is riverbed dredging. To boost its capacity to discharge floodwaters, the river has been dredged. The lowest portions of the riverbed have a high silt concentration due to their low gradient. Over ten years, roughly 10 million cubic meters of material have been dredged from the river. It is utilized to create houses, roadways, and higher village sites to provide relief from floods. The Regional Drainage Board has constructed several drainage projects in low-lying, flood-prone areas. Floodgates are a system of outfalls and drains that are intended to let

floodwaters out while keeping seawater out (SOPAC, 2007).

Currently, Fiji's legislation covers various water services; however, it is unclear how to manage land and water resources (IWRM). There is legislation governing the use of rivers and streams for drinking water, irrigation, and urban water supply (Water Supply Act, 1985; Irrigation Act, 1985; Mining Act, 1978). (Rivers and Streams Act, 1985). The Rivers and Streams Act, originally a colonial decree, permits native Fijians to engage in customary practices in small streams and allows the Lands administration to sanction water abstraction from rivers. The Act includes provisions that strongly imply that the government has the authority to control access to water resources. The Environment Management Act of 2000 also added protection measures for freshwater and marine water quality and the preservation of critical natural features (SOPAC, 2007).

According to Hossen (2015), water governance must adhere to three essential principles: multilateralism, ecological integrity, and indigenous knowledge, to ensure the sustainability of water policy and community empowerment. This governance model can restore the community's rights to natural resources and environmental conservation by fostering a connection between land, water, and community. Protecting these rights, founded on socioecological activities, is necessary to uphold ecological citizenship (Orlove and Caton 2010). In this sense, multilateral coordination across communities, organizations, and institutions is necessary (Folke et al., 2005).

Community-based organizations can act as a vital link in bridging gaps in the management of watersheds by offering a practical, local viewpoint on management requirements that cut beyond political lines. CARP, a 1990-founded environmental non-profit with charitable registration, aims to improve the ecological health of the Annapolis River watershed via science, leadership, and community involvement (Acadia Centre for Social and Business Entrepreneurship [ACSBE]). CARP also aims to involve residents and landowners in several projects to enhance and improve watershed management and ecosystem health. To involve citizens, promote stewardship, and enhance watershed management, CARP's unique position as a community-based watershed group makes engagement with a range of stakeholder groups, academia, government, and local communities possible (Cliche et al., 2016).

The second widely used discourse has to do with participation and culture. Community members are urged to invest in them to increase equity, quality, and a sense of control over projects. This helps enhance the management of water resources and ecological sustainability. Associating the word "participation" with equality, "choice," and "people being able to express their opinions and concerns in a way that is understood" (Agarwal & Gibson, 2001; Cooke & Kothari, 2001). Therefore, participation is connected to democratic discourse (Hickey & Mohan, 2004). Involvement has taken a dominant position in development discourses, according to Cooke and Kothari (2001), but it also hides the workings of unjust and unlawful power plays (Sultana, 2009).

Methods

A qualitative descriptive case study approach was adopted in this investigation. The findings of the field survey that was done between September 2019 and January 2020 make up the data in this study. The information is acquired through semi-structured interviews, observations, and documentation. Individual interviews with each respondent are conducted during semi-structured interviews. Detail-oriented information can be gleaned from the respondent solely through dialogue. The validity of the results was upheld by using a triangulation technique. Field data was collected between September 2019 and January 2020, and semi-structured interviews with The Fiji Sugar Corporation (FSC) officials and neighborhood members were also done. Three locations—Batnikama, Basoga, and the FSC-owned and -operated Labasa Sugar Mill—were chosen for the interviews. A focus group technique was selected to examine the connections between respondents' activities on various concerns using a set of guiding questions that are often used in river management decision-making (Entwistle & Peterson, 2004).

Participants in the focus groups were recruited at random. Eleven people were interviewed, including two FSC officials, one representative from the Ministry of Health, one representative from Fairtrade, and seven local community members, including the village headman (Table 1). To learn more about the significance of the Qawa River to the local population, activities centered around the river, initiatives to preserve the river environment, and challenges encountered, structured interviews were performed. To learn more about the informants' experiences with the

river environment and the community's role in river management, the interviews utilized open-ended questions that allowed the informants to respond freely. Hindi and English were both used throughout the interviews. Smartphones were used to record the interviews. To make data analysis easier, the recordings were later transcribed. By building themes and patterns in the data based on the substance of the interviews, the data from the analysis was used to reach conclusions. To ascertain the underlying significance of the interviews, the content of the interview transcript was examined. Data sorting and retrieval were done using the coding system.

Table 1 Survey Method in the Village surrounding Qawa River and Fiji Sugar Corporation

Community/Organization	Batnikama local community	Basoga Village	Labasa Sugar Mill
Justification of surveyed area	-related agencies - residents/organization situated along the riverbank		
Technical survey approach	Secondary Data collection, structured interviews		
Date of survey (month/year)	September 2019-January 2020		
Informants and their function	Student Village Headman Ministry of Health official Fairtrade official	Farmer Housewife Teacher	Mill operations official Field officer-FSC, Labasa Natokamu village resident Village Headman
Interview duration	1-2 hours for every resident 30 minutes to 1 hour for officials		

Source: Prasad, 2020

Results and Discussion

The findings begin with the description of the Sugar Industry in Fiji: Its economic importance and impact on the Qawa river, the physical characteristics of the Qawa River, Livelihoods dependent on the Qawa River, Water Quality of the Qawa River, Qawa River Management, Community Participation in Qawa River Management and the Challenges for Qawa River management. It concludes by outlining the collaborative efforts of the stakeholders in Qawa river management and the challenges they face in

implementing the various rules and regulations to conserve the river.

The Economic Importance of the Sugar Industry in Fiji and Its Effects on the Qawa River

Eight percent of the GDP and five percent of exports are made up of sugarcane, which continues to be a significant source of income for many Fijians. According to estimates, more than 20% of the population depends on sugar-related activities. Half of the 44% of rural Fijians who are less below the poverty line reside in the "sugar belt." The Fiji Sugar Corporation is a government-owned corporation that is the country's most extensive public enterprise. It employs about 3,000 people in Fiji's rural sugarcane belts, and 200,000 rely on it for their livelihood. The industry remains one of the primary sources of foreign cash and provides income for a sizeable percentage of the population. However, despite its significance, the sugar industry pollutes water substantially more than other sectors (The World Bank, 2017). A sizable portion of the population receives income from the sector, which continues to be one of the primary sources of foreign currency. The sugar business pollutes water significantly more than other industries (The World Bank, 2017). Almost all steps of sugar manufacturing generate wastewater with varying amounts of contamination (Table: 2). Sugar cane industries are water-intensive, which means they use a lot of water during the production process.

Table 2 Waste generated at various stages of the manufacturing process

Process stages	Main inputs	Waste and by-products
Millhouse	Sugar cane	Wastewater containing suspended solids and oil content Washing from floor cleaning containing sugar bagasse
Procedure house	Sugar juice	Washing of different components such as evaporators, juice heater, vacuum pan, clarifiers, etc., generates aggressive effluents with high BOD, COD, and TDS concentrations.
Boiler house	Bagasse and Furnace oil	Wastewaters from scrubs
Cooling Pond	Water and chemicals	Wastewater

Source: Santos, 2008

Based on agriculture, sugar mills contribute significantly to a nation's economic and social development. Large amounts of freshwater are required for sugar milling processes, and this water is discharged as bulk effluent into the environment. Factories consume a lot of freshwater, and their effluent is contaminated with chemicals, suspended particles, and other organic and inorganic waste. The bulk of toxic chemicals used in sugar production can eventually find their way into streams and degrade the quality of freshwater bodies if they are not adequately managed (Qureshi et al., 2015). Cheesman (2005) claims that a high proportion of suspended particulates in parts of the sugar mill's wastewater causes drainage and ditch blockage. These also have a more substantial environmental impact due to the settled debris' slow decomposition.

In general, it is believed that the total dissolved solids (TDS) levels in sugar mill effluents are not high enough to have a substantial environmental impact. On the other side, dumping wastewater with high TDS levels can kill aquatic life, making the receiving water unfit for agriculture, domestic use, or human consumption. Sugar cane effluents also cause pollution in marine habitats by altering their pH, temperature, and color. In addition to being unattractive to sight, colored waters block light. Inhibiting algae development causes inefficient photosynthesis at more profound levels in rivers, which lowers the amount of dissolved oxygen in the water (Singh, 2000). Aggressive effluents with high concentrations of BOD, COD, and TDS are produced by washing various parts, including evaporators, juice heaters, vacuum pans, and clarifiers, in the Qawa river (Santos, 2008). This alters the river's look while also giving it a foul smell.

The natural pH of the receiving water body is somewhat altered by the effluents from sugar mills, making it either too acidic or underly alkaline. Extreme acidity can result in the release of dihydrogen sulfide into the environment (Akbar & Khwaja, 2006). Waste fluids that are dumped into rivers also contain a lot of salt and are harmful to aquatic life (Kumar & Chopra, 2010). Therefore, before being released into river systems, sugar mills' wastewater must undergo appropriate treatment to lower its organic content (Akbar & Khwaja, 2006; Yadav & Pathak, 2012). A Mill Operations Official had the following to say:

"...the dumping the by-products from the mill into the Qawa River changes the pH, which in turn harms flora and fauna present in this river

ecosystem. This problem can only be solved if the FSC disposes of its waste appropriately. This is a severe problem as it affects many nearby communities' dependent on the river for their survival..."

The innocent and vulnerable community is bearing the failure of the FSC to dispose of its by-products appropriately. The river ecosystem is at risk, and nearby residents face numerous problems annually during the crushing cane season.

The Qawa River

Pollution is made worse by the Qawa River's meandering and slow movement near the sugar mill's discharge site. The high density, organic-rich discharge sinks due to a depression in the riverbed near the discharge point, deoxygenating the river. Locals have voiced their disapproval of the river's state, especially during the "dry" season when the river flow is relatively slow. Unfortunately, this happens during the crushing season when many carbon-rich effluents are dumped into the river (June to November). For more than 20 years, Labasa residents have been worried about the condition of the Qawa River (Karan, 2010). It is exceedingly harmful to the FSC Mill to discharge into the Qawa River. There is no aquatic life in the river. Old and worn-out sewer systems cause sewerage to overflow. Waste industrial oil and parts are dumped into sewers. Squatter colonies disrupt the mangrove ecology, and intensive logging and cultivation close to rivers contaminate water supplies (SPREP, 2004). Headaches, nausea, and dizziness were also noticed in surveys performed at schools and villages close to the Qawa River (Karan, 2010). Health-related issues remain a significant concern, particularly during the sugar mill's crushing season. According to interactions I had with a young person at the nearby All Saints Secondary School:

"... usually when the sugar mill is fully operational, many students fall ill daily. They complain of the strong stench from the river that causes severe headaches and vomiting. This has been happening for a long time now..."

This explains the extent of the health hazard posed by the polluted Qawa river to the school community. This has been an ongoing concern, and appropriate actions are needed as soon as possible. In 2008, a 1000 pupils at All Saints Secondary School survey revealed that almost all students displayed nausea, dizziness, and headaches. Adverse effects on students' lives have an impact

on their education as well. Students and residents near the river are suffering (Karan, 2010).

Livelihoods dependent on the Qawa River

The Qawa River is important to locals' day-to-day activities. Numerous tiny towns and villages along the Qawa River rely on the river for recreation, transportation, agriculture, food, washing, and bathing. The surrounding settlements of Basoga and Batnikama use the river for economic purposes as they catch mud crabs and freshwater mussels to be sold at the Labasa market. The Qawa River provides fish and crabs to up to 500 people. The river is instrumental during periods of low or no access to potable water (Government of Fiji, 2017). According to the Village Headman:

"the crabs and fish are gone, and nothing can be done to find them in the mangrove swamps or by line fishing in the Qawa River. This loss happens every six months throughout the season of crushing sugar cane. In what was once a river teeming with life, has driven the residents of Natokamu and Cawaira into a desperate search for sustenance. To make a good catch, the struggling Cawaira fishing village in the Solomon Islands had to venture further out to sea.

Another Natokamu Villager reported that a favorite river food, the bakera (crabs), had disappeared. The eight families in Natokamu, according to the village headman, depend primarily on the river.

If they can't buy food from the shops, "their money, their food source, is all gone, so it's largely just cassava and tea."

This shows the extent to which the Qawa river pollution has impacted the livelihoods of the surrounding community. The high content of toxins dumped into the river affects the food chain, affecting the availability of food supply for the residents. The total dissolved solids (TDS) in sugar mill effluents is typically considered insufficient to have a substantial environmental impact. On the other hand, the discharge of wastewater with high TDS concentrations can kill aquatic life, rendering the receiving water unfit for human consumption, irrigation, or domestic use. At times the community members can merely fend for themselves and their families as the community relies on the river for their sustenance.

Water Quality of the Qawa River

The Qawa River in particular, has been in the news for more than 20 years due to its high levels of pollution. One of the most contaminated rivers in

the area may be this one (Karan, 2010). According to reports, the stench emanating from Labasa's polluted Qawa River has worsened. The river is covered in a thick dark substance that turns the water black and gives off an odiferous odor. Those affected by the stench have claimed that the pollution is the fault of the Fiji Sugar Corporation's Labasa mill (The Fiji Sun, 2010). The hazardous discharge from the Fiji Sugar Corporation mill, according to Advisory Councillor Timoci Biroko, wiped out life in the Qawa River. Pollution is also found in small streams and rivers that branch off the Qawa River. This condition persists year after year, affecting six to eight months. The river food is gone as soon as the cane-crushing season begins. Dead fish, crabs, malea, and everything else that lives in this river float to the surface, dead two weeks after the mill opens (The Fiji Times, 2009). Many rivers in Fiji have been contaminated as a result of these activities. According to the farmer:

“...the disposal of wastes and mill cleaning processes and activities, the colour of the water changes to black and gives out a horrible smell. The water remains black for as long as 6 months until the end of the crushing season...”

The Fiji Sun reports that in 2009, the residents of Natokamu expressed their displeasure about the Labasa Fiji Sugar Corporation's use of the Qawa River as a disposal area during the cane-crushing season. The Qawa River was contaminated due to the mill's trash being poured into it during the crushing process. Their biggest worry was the foul odor coming from the river, which frequently contaminated their surroundings. They had previously encountered this issue, but FSC could not resolve it or improve things. The unpleasant stench also impacted the kids at All Saints Secondary School.

“...we sometimes see dead fish on the river banks and sometimes floating in the water. This happens because of the chemicals that are dumped into the river by the sugar mill. This situation is common every year...” (Teacher) According to the headman of Vunivau Village and a district official from Labasa, river contamination has impacted their food supply. The community has been severely restricted in its ability to contribute traditionally to the vanua of Labasa. The Marama na Tui Labasa must be presented with mussels during a customary ceremony. However, they have perished due to the river's pollution (The Fiji Times, 2016). According to the University of the South Pacific Institute of Applied Sciences (USP-IAS) Fiji's R2R Project Report 2021, orthophosphate, total phosphorus, sulfate,

chemical, and fine particle concentrations in the Labasa, Wailevu, and Qawa waterways were significantly higher than those at elevated sites upstream with less human activity. The increased chemical oxygen demand, organic carbon, and decreased dissolved oxygen concentrations in the Labasa and Qawa Rivers all indicate contamination from organic sources. Both sediment and water samples from the Wailevu, Qawa, and Labasa waterways contained chemical, microbiological, and physicochemical parameters that were close to or exceeded the normal guideline values for water and sediment quality established by the United States Environmental Protection Agency (USEPA), the World Health Organization (WHO), and the Australian and New Zealand Environment and Conservation Councils.

Qawa River Management

To improve flood conditions, dredging is done in the lower catchment region of the Qawa River, most recently in 2018, at the mouth of the river in Labasa. To deepen and widen the river, dredging removed sediment from it. The dredged area was 1.5 kilometers long and five meters deep and spanned from the river mouth to the ocean (FBC, 2018). The Labasa Drainage Board's Soasoa Drainage Scheme is just one of the many drainage and flood control systems that have been put into place within the basin. As part of this plan, a system of levees and floodgates was built to protect reclaimed land in the lower watershed (GCCAPlus, 2020).

To lessen flood damage to houses, cities, villages, and agriculture, the government budgeted \$6 million for flood mitigation measures in 2010. These funds were used for several significant projects, including the third phase of dredging the Nadi River, maintenance dredging of the Qawa and Wailevu rivers in Vanua Levu, the Rewa river in the Central Division, rehabilitation of the Mulomulo Dam, and construction of a new dam in the Nadi Watershed, and repair of river bank protection works at Nawaqarua Village in Ba. Dredging was necessary to maintain the Qawa and Wailevu rivers' capacity to discharge floodwaters and to enhance ship navigation into the municipality of Labasa (The Fijian Government, 2010).

To prevent any overflows into the residential areas of Qawa Flats, Soasoa Flats, Basoga, Vunivau, Namara, Nagai Village, Nacula Village, Wasavulu Village, Nailawa, Nasekula Village, Wailevu Flats, and Tabadola Flats, the Ministry of Waterways

intends to dredge 80,000 cubic meters of soil and silt from the Labasa, Wailevu, and Qawa River (World Wide Fund for Nature, 2020). In 2008, the Environment Management Act 2005 (also known as the Fiji Environment Management Act 2005) enacted regulations for environmental contamination in Fiji. The EMA defines pollutants as:

"dredged spoil, solid or liquid waste, industrial, municipal or agricultural waste, incinerator residue, sewage, sewage sludge, garbage, chemical waste, hazardous waste, biological material, radioactive materials, wrecked or discarded equipment, oil or any oil residue and exhaust gases or other similar matter."

A person (and FSC is a person under Fijian law) who negligently damages another person's property by releasing dangerous substances or pollutants may be liable through tort law. We believe the class of plaintiffs would include owners of traditional fishing rights (Tuivanualevu, 2017). In accordance with the law, the EMA expressly supports claims that have sustained losses due to "pollution incidents." According to the EMA, a pollution incident is "the introduction, directly or indirectly, of a waste or pollutant into the environment, which results in harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of water, air, or soil, reduction of amenities, or creation of a nuisance."

Several legal issues arise if it is true that the FSC is dumping trash into the Qawa river and creating "pollution events" and that this pollution is harming people's health, producing financial losses, loss of wages, and any natural environment or resource. Fiji's common law and the Environmental Management Act (EMA) offer legal defenses against pollution incidents and the predicted harm they cause. The Qawa River's traditional fishermen may also be impacted, and their livelihoods could be adversely affected. The law should act as a deterrent even though it does not fully address environmental degradation. However, it would be preferable if polluters served as responsible citizens and looked for environmentally friendly ways to dispose of their garbage rather than risking legal repercussions for their irresponsibility (Tuivanualevu, 2017).

Unless alternative use is authorized by the Town Planning Act, the public's access to rivers, streams, and the areas along their banks is governed by the Rivers and Streams Act. Residents who live close to rivers and streams may apply for additional

rights to extract water and establish permanent building structures under this program, which is run by the Ministry of Lands and Mineral Resources, with the agreement of the Minister or Director of Lands (Rivers and Streams Act, 1985). According to the Health Inspector:

"The Health Department of the Labasa Town Council conducted tests on the river and discovered all the food villagers held dear was dead at the bottom. This includes fish, crabs, and mussels to name a few. Despite the poor condition of the river, no concrete solutions have come about to improve the rivers' health and the livelihoods of the surrounding community..."

The residents of Basoga and Batnikama are frustrated by the actions of the Fiji Sugar Corporation (FSC). Despite numerous attempts to help solve the problems of improper waste disposal by the FSC, the plight and complaints of the community seem to be falling on deaf ears.

Community Participation in Qawa River Management

Six villages in Vanualevu's district of Wairiki, Cakaudrove, are focusing on rehabilitating the Labasa and Qawa rivers through efforts such as tree replanting on degraded land areas and river buffers. The community effort aims to protect and preserve the Labasa river's critical ecosystem functions, which include providing safe and clean drinking water, food, and economic livelihood activities such as agriculture. Their commitment is the focal point of the Fiji Global Environmental Facility's 5 Star Ridge to Reef (R2R) water catchment management project for the two main islands of Viti Levu and Vanua Levu (WWF, 2020).

Community representatives from the villages of Matalolo, Satulaki, Koromakawa, Suweni, Vunitalice, and Sokena-Navakuru situated on the banks of the Qawa River, took part in an intensive discussion about the effects of unsustainable land practices on their landscapes and the significance of better managing the health of their rivers, forests, and streams at a workshop hosted by the WWF-Pacific in 2019. The headwaters of the Labasa river are where these villages are situated. By helping the villagers identify problems impacting them and their environment and evaluating the project's progress, the WWF was able to increase awareness of the work being done in Macuata (WWF, 2020).

The WWF-Pacific workshops sought to gather as much information as possible from resource

owners living within the Labasa water catchment to identify critical threats affecting the river and communities downstream that call for immediate action and establish a management system to ensure the damage is gradually reversed. According to the director of WWF Pacific Conservation, the workshop also sought to collect traditional knowledge about how villagers go about doing things to integrate it with scientific findings from the University of the South Pacific and other implementing partners to develop a management plan that could be implemented at the community level (The Fiji Times, 2020).

The goal was to strengthen a Wairiki District Committee that would collaborate with partners to implement critical actions for the protection and management of the Qawa and Labasa Rivers as part of the broader Labasa Watershed Management Plan. The Wairiki and Labasa Districts contain the Labasa and Qawa Rivers. The project aims to improve collaboration between resource owners and stakeholders to identify critical gaps and needs in marine and terrestrial biodiversity conservation (The Fiji Times, 2020).

Challenges for Qawa River Management

The MOE currently has limited human, technical, and financial resources to execute the EMA, although it is now supported by current, applicable environmental legislation. The Ministry has a restricted number of professional and support staff members and has requested more employees. An assessment of the staffing needs reveals that the EMA will require 59 employees to be implemented successfully. Additionally, the MOE has less experience with regulatory waste administration and enforcement, aside from its engagement at the policy level (Thaman et al., 2005). To effectively implement the EMA at the local level, the Ministry will need employees, resources, and training; however, the government does not appear willing to provide the Ministry with the funding to build its capabilities (Thaman et al., 2005). The local sector heavily relies on New Zealand and Australia for guidance on the best wastewater treatment technology. In the case of wastewater management, consultants from other countries are frequently sought after. There are a few wastewater-experienced consultants in Fiji, although they primarily serve the country's institutions of higher learning and resorts. However, there are no local producers of oil-water separators in the nation. There are two local producers of pre-treatment facilities for industry

(such as grease traps or settling pits) (Kirkwood and Hughes, 2005).

According to the Fairtrade official:

...even though the government implements relevant and strict regulations for pollution and waste disposal, there is a lack of proper management and monitoring that can reduce the problems faced by the Qawa river community. It seems that rules are just on paper without any adequate implementation. Those who disobey the regulations are not punished as well...

The residents who live close to the Qawa River have been asked to be patient by the Department of Environment. An excerpt from the conversation with one of the residents is provided below.

...Fiji now has the Environment Management Act (EMA) with its penalties, and now we can take FSC to court. I hope that the EMA will punish FSC so that the condition of the Qawa River can go back to what it used to be in the past... (Housewife) The second obstacle is the lack of appropriate waste management technologies and information. The FSC lacks the right technology to treat wastewater and the by-products from sugar production. Hence the Qawa River is used as a dumping ground as it is adjacent to the Sugar mill. Using proper technology would significantly help reduce river water contamination and damage to the marine ecosystem. Based on the residents' interviews, the government needs to avail appropriate technology to solve this prolonged issue of river pollution throughout Fiji. Here are some results of the interview related to the lack of proper waste treatment machinery:

...instead of spending so much money annually to hire experts for consultation and dredging, the government needs to make a onetime investment and purchase the much-needed machines which could be used to treat the wastewater from the Labasa Sugar Mill as well as solve the problems faced by the Qawa River and the nearby community... (Field Officer, FSC).

Proper planning and implementation of strict rules and regulations and investment in technology is the long time solution to the pollution at Qawa river. The government of the day needs to relook into the plight of the Qawa community and draft appropriate policies to sustain the community's livelihoods. The FSC, on the other hand, needs to be considerate and engage in sustainable waste disposal practices with minimal disturbances to the environment and the livelihoods of the surrounding community.

Conclusion

The conclusion of this study can be described as follows. First, the Qawa River plays a vital role in the surrounding community as the residents are dependent on this river for their livelihoods. The Basoga and Batnikama community utilize this river for their daily food needs. The mangrove swamp on the river bank also acts as a barrier during the rainy season. The Qawa River connects the fisherman to the sea. It provides transportation of harvested sugar cane to the Labasa Sugar Mill via the bridge that hovers across the river with the railway tracks embedded in it. The surrounding village of Natokamu utilizes this river for bathing and washing during the dry months.

Secondly, the Qawa River's dredging has been initiated by the Labasa Town Council in collaboration with the Ministry of Waterways. The Ministry of Waterways allocated 3 million Fijian dollars in the 2017-2018 budget to purchase dredgers. River dredging would reduce sedimentation and, to some extent, bring back the river to its natural state. The Department of Environment, Ministry of Health, Labasa Municipal Council, and the Macuata Rural Local Authority are trying hard to resolve the issue. These authorities have been working with Commissioner Northern to enforce the Environment Management Act and monitor compliance with the Mill operations' permit conditions.

Finally, many challenges are encountered by the community members, the government departments, and the local authorities in the management and improvement of the Qawa River. Challenges such as implementing the Environment Management Act, sustainable use of the river by the local community, and the Labasa Sugar Mill are just the tip of the iceberg. There is a general lack of coordination between the relevant authorities responsible for the restoration and improvement of the Qawa River. A lack of consultation with the villagers and community members remains one of the major loopholes in the effective rehabilitation of the Qawa River.

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