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Water Crisis Management in a Tourism Dependent Community

Aishath Shakeela

***Abstract*—**At a global level, water stewardship, water stress and water security are crucial factors in tourism planning and development considerations. Challenges associated with water is of particular concern to the Maldives as there is limited availability of freshwater, high dependency on desalinated water, and high unit cost associated with desalinating water. While the Maldives is promoted as an example of sustainable tourism, a key sustainability challenge facing tourism dependent communities is the efficient use and management of available water resources. A water crisis event in the capital island of Maldives highlighted how precarious water related issues are in this tourism dependent destination. Applying netnography, the focus of this working paper is to present community perceptions of how government policies addressed Malé Water and Sewerage Company (MWSC) water crisis event.

***Keywords*—**Crisis management, government policies, Maldives, tourism, water.

I. Introduction

GLOBAL tourism have rapidly increased over the years, with destinations around the world in 2014 receiving a record 1,135 million international tourists arrivals [1], and South-East Asian region receiving 8.5% of the total volume of tourists. The increasing tourist numbers have implications on destination sustainability, as tourism remains one the largest consumers of water at a local, regional and global scale [2], [3]. Direct water consumption by tourists include for personal use such as showering, flushing toilets, laundry services, in leisure activities such as spas, and swimming pools. Indirectly, water is consumed by tourist through travel to destination, hotel construction and landscaping, use of linen, hotel cleaning and housekeeping, and food and beverage. In comparison, locals consume water for personal use, such as cleaning and cooking purposes. Other local consumption of water mainly revolves around agriculture.

Issues related to water quality is an important tourism operational issue, where tourists expect certain standards of purity for drinking, bathing or recreational use [4]. Reference [5] analyzing water use efficiency in 21 hotel establishments in Barbados found the sector consumed 839 liters of water per tourist per day. Similarly, [6] estimated that water consumption in tourism at a global level, can range between 80 to 2,000 liters per tourist per day. A significantly larger amount of water is consumed in higher standard accommodation and resort-style hotels [6], [7]. Tourism sector in many Asian countries were identified to consume substantially higher water levels than the locals.

Aishath Shakeela is with the Griffith University, Nathan, Australia (phone: +61 7 5552 8359; fax: +61 7 5552 8507; e-mail: a.shakeela@griffith.edu.au).

In addition to increased water consumption due to increased number of arrivals, water stress is exacerbated with increased population growth, urbanization and forecasted impacts of climate change. Tropical coastal zones such as the Maldives, which are popular island tourism destinations, are at significant risks from climate change. Consequently, increased number of tourist arrivals to these destinations increase stress on available water sources [8], making efficient water resource management a key sustainability challenge [9], [10].

Non-sustainable tourism and urbanization have negative effects on water quality [11], and manifest as a sustainability challenge for tourism dependent destinations. Recent research within the context of Nicaragua [12] and Bali [13], [14] revealed conflict between tourism operations and locals as a result of mismanagement of water and water inequity. Research carried out by Tourism Concern [15] within the context of Bali, The Gambia, Zanzibar, Goa and Kerala, found weakly regulated tourism operators utilized water at unsustainable levels, and depleted and polluted water, threatening the environment and undermining living standards, livelihoods and development opportunities of disadvantaged local communities. Water management and equity thus holds potential to create conflicts between tourism industry, other competing industries, and locals. According to [16], within the context of Cyprus, a fierce competition for water resources has already emerged among industries competing for this finite resource.

Conflicts over supply and demand of water have a direct bearing on the environmental and socio-economic condition of tourist destinations [12]. Further, as [17] stated, media portrayal of water crisis can have devastating effect on tourism destination image. For this reason, [8] recommends impact of tourism on water resources to be viewed as a key local sustainability challenge that requires appropriate management interventions, especially in water scarce destinations. Water related issues can manifest as crisis events within tourism destinations. However, [18] argues that within the tourism context, there is a lack of research on crisis events, its impacts on the industry and the society. Further, to-date there is limited research on how water crisis impacts tourism dependent communities in small island destinations.

For the purpose of this working paper, crisis is defined as "a situation where the root cause of an event is, to some extent, self-inflicted through such problems as inept management structures and practices or a failure to adapt to change" [19, p.136]. Using the context of a water crisis event at Malé Water and Sewerage Company (MWSC), this working paper present community perception of how government policies addressed

the water crisis event in the tourism dependent community of Maldives.

II. Literature Review

As tourism development in islands has potential for negative outcomes, sustainable tourism development paradigm has generally been adopted to varying degrees. The United Nations World Tourism Organization [20, p. 12] defined sustainable tourism as one which "takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities". Within the latter context, water resources and how they are managed is of crucial significance to destination sustainability. However, [21] notes that due to complexities surrounding what is meant by sustainable tourism, lack of clarity on appropriate indicators, measurement protocols, thresholds and benchmarks, implementing sustainability has remained a 'wicked problem'.

The IPCC [22] projects increased coastal erosion, heat and draught, reduced precipitation, saltwater intrusion into aquifers as climate change risks facing island destinations. This creates stress on existing potable water resources. Water stress, defined as a function of renewable freshwater availability, abstraction rates and the share of consumptive use [6], can be exacerbated as a result of increased demand on water for tourism consumption. Tourism, a water intensive industry, however must not be expanded with negative consequences on local communities. Indeed as [23, p.102] argues, for tourism to be sustainable and equitable "the local residents must not miss out on water for the sake of tourists".

As water is a basic human right [24], local communities have as much right to clean and safe water as visiting tourists. Yet access to it may be constrained due to discrimination and inequalities [25]. For tourism to be truly sustainable, key emphasis needs to be given to equitable access to water among tourism dependent local communities. Indeed, the socio-economic and environmental dimensions of tourism sustainability are interconnected, and dependent on water resources and how they are managed.

III. Study Context

Geographically formed as 26 natural atolls, the Maldives is consists of 1,192 coralline islands. The country stretches 820 km north to south, 130 km east to west at its widest point. With a total land mass of 298 km2, the Maldives is the smallest Asian country. On average the islands are less than three meters above sea-level.

The Maldives is a hyper-dependent tourist destination, with tourism growing at a phenomenal phase since inception of tourism in 1972. Over the past 43 years, tourism has replaced the traditional fishing industry. Today there are 110 enclave resorts, 19 hotels, 135 guesthouses and 163 safari boats (dhoni) with a capacity of 29,949 beds [26]. An additional 106 properties are under development as tourist accommodation [27].

Due to the smallness of islands, resorts are compelled to be developed as self-contained enclave operations on a one-island one-resort basis. All resorts have their own power generators, water desalination plants, sewage treatment, transport facilities, telecommunication systems, and souvenir shops. Maldivian economy is highly dependent on 3S tourism, with the industry contributing 28% to GDP and 38% to government revenue in 2013 [26]. The industry remains the largest foreign exchange earner and employer.

The local population of 341,000 resides on 188 islands, administered as seven provinces [28]. To minimize developmental challenges and economic cost associated with dispersed population, the government at times has carried relocation programs, which is highly unpopular among locals. For easy access to higher education, improved health and other welfare, over 39% of local population reside in the capital island Malé. Further, a large number of expatriates and a transient local population from outer atolls reside in Malé, an island approximately 2 km2 (Fig. 1), making it one of the densely populated capitals.

Fig. 1 Male' in relation to the international airport [29]

The tropical climate is a key attraction for international tourists visiting the Maldives. The average maximum temperature throughout the year at Malé is 31.2°C with a relative humidity of 78% [30]. The country has two monsoons, the southwest monsoon (May to November) bringing rain, and northeast monsoon (December to April), the dry season. The northeast monsoon period is when most international tourist is received to the country (Fig. 2).

Evidence suggests that precipitation patterns are changing, with north of the country being drier and south being wetter, with the dry seasons extending. In 2013, the annual precipitation in the southern atoll of Gan was 2,373 mm of rainfall, with the northern atoll of Hanimaadhoo receiving 1,897 mm of rainfall. During the same year, Malé received 2,082 mm of rainfall [30]. Apart from the rainfall, the country has little to no fresh water sources.

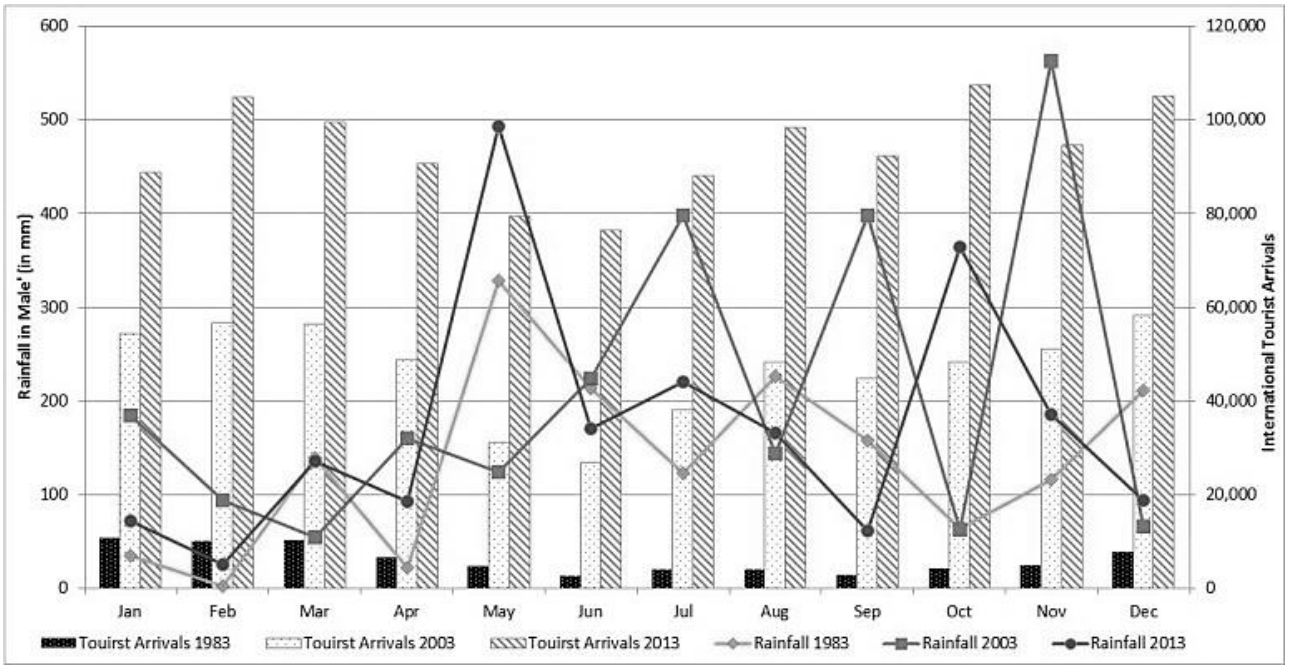

Fig. 2 International Tourist Arrivals and Rainfall (for Malé only)

The Constitution of the Maldives [31, Chapter 2, Section 23] defines water as an economic and social right, and provides a constitutional guarantee to its citizens that reasonable measures will be taken to provide adequate and clean water. In this regard, a core strategy of the Millennium Development Goals [32] is to halve by 2015 the number of people without access to safe drinking water. Despite these aspirations, a huge disparity exists between Malé and other inhabited island communities in access to clean water. Following the Asian tsunami 2004, those with access to clean water has fallen sharply from 96% in 1990 to 83% by 2006 [32], with island communities being highly disadvantaged.

A. Sources of Freshwater in Island Communities

Unlike larger islands such as Vanuatu and Fiji, Maldives do not have rivers. Wetlands (*kulhi*) are found in only 41 out of 1,192 islands [33], and are either brackish or freshwater, and almost always support mangroves. Hence, groundwater and rainwater has remained vital sources of freshwater for island communities. Rainwater is the primary source of drinking water in island communities, harvested using roofs and channeled into individual domestic and island community rainwater tanks. Groundwater is used for cooking, washing, bathing, cleaning and agriculture. Ground water source is however facing a number of risks.

Firstly, all islands in the Maldives have very shallow water tables, which are usually found no more than two meters below the ground surface, with the freshwater lens being very thin [34]. Reference [35] analyzing six atolls found significant decrease in thickness of freshwater lens occur during dry seasons, leading to complete depletion in smaller islands.

Secondly, often in inhabited islands in-ground septic tanks are built less than one meter from the groundwater well [36], and sewage from pre-sedimentation tanks and soakaways, and other pollutants transfer through highly permeable soils [36]. Thus in many inhabited islands groundwater is unsafe for consumption due to fecal and pollutant presence.

Thirdly, due to increased population growth and urbanization and resultant over-extraction, ground water salinity has increased. Reference [34] estimated that on average groundwater recharge is approximately 40% of rainfall in densely populated islands during wet seasons. Within Malé, there is limited opportunity to recharge freshwater lens as there are very few open spaces, with most of the island paved and drainage connected direct to ocean outfalls. While there is no available data of groundwater extraction rates in the country, ongoing dewatering for construction purposes depletes whatever available groundwater in Malé. Further, with increased sea level rise and coastal erosion have led to saltwater intrusion into aquifers in these low-lying islands.

The vulnerability of the Maldives to natural disasters was seen in the events following the Asian tsunami 2004. According to the United Nations Development Program [37], this risk event resulted in saltwater intrusion into aquifers on almost all of the islands, as well as the damaged sewerage systems contaminating the groundwater. Further, UNDP [37] estimated the potential loss of up to 1,000 island community rainwater tanks and 6,000 individual domestic rainwater tanks, equivalent to 20,000m^3 of annual rainwater supplies were lost following this risk event.

A combination of the above risk factors means that during dry seasons, islands communities with limited roof catchments area or no domestic rainwater tanks rely on government to provide desalinated water at no cost to local communities. For instance, by end April 2015, 42% of inhabited island communities have reported water stress and requested

assistance [38]. To provide adequate and clean water to local island communities, desalinated water is transported from Malé to the affected islands.

B. Sources of Freshwater in Malé

Due to the poor quality of groundwater and increased demand for water in Malé, the first desalination plant to purify saltwater using reverse osmosis technology was installed in 1988 with a capacity of 200m^3/day [34]. Residents of Malé now extensively rely on desalinated water piped to households for personal use. Bottled desalinated water is commonly used for drinking, with some consuming rainwater. Groundwater is used for toilet flushing, with some residents reliant on desalinated water for this purpose due to anaerobic bacteria presence in groundwater giving it a rotten odor.

With vision of providing safe water and sewerage services that is sustainable, affordable and environment friendly, the MWSC, this joint venture company serves 26,000 customers in Malé. This is the sole desalination water provider in Malé. A fire incident at this plant on 4 December 2014 essentially brought a halt to the operation. This crisis event was highly publicized in the local media, and also covered to some extent in the international media.

IV. Methodology

This research adopts netnography [39] or ethnography adapted to study communications of virtual communities, defined as 'participant-observational research based in online fieldwork' [40]. Netnography offers a naturalistic, unobtrusive and interpretive methodology to study virtual community perceptions of crisis event at MWSC and their views on how government policies addressed the water crisis event.

A key distinction between netnography and traditional ethnography is that the researcher is not physically present in the field, but is virtually present to study online discourse [41]. A limitation of netnography is that commentator age, gender, education level etc. or authenticity of commentator location cannot be established and appended to quotations as per convention. Further, netnography does not allow interpretation of visual and auditory stimuli. Finally, the need to set a cut-off date for comments means that the 'long tail' of residual comments that continues to develop long after the crisis event is omitted from the analysis.

Procedurally, all relevant commentaries from online local media sources in the Maldives between 4 December and 30 December 2014 were identified. This 26-day extraction period pertained because of the dramatic erosion of commentaries after the first five days, with the last week of this period yielding only 3% of all commentaries. Altogether, 2,290 commentaries were obtained from three local sources. All commentaries were in local language Dhivehi.

In order for coding to take place, all commentaries were translated by a bilingual researcher. To ensure language nuances were retained, the translated material was cross-checked by a second bilingual researcher. Using NVivo coding was undertaken to identify key themes and sub-themes. Discourse analysis, which emphasizes socially interactive aspects of written and spoken language as the primary context for extracting meaning [42] was used. Manifest and latent coding were applied to extract and organize discrete reactions. With the assistance of NVivo, manifest codes were derived as quantifiable keywords and phrases. Latent content analysis subsequently interpreted implicit meanings.

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