



A POLITICAL ECOLOGY OF WATER EQUITY AND TOURISM A Case Study From Bali

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Abstract: Many island destinations are struggling with tourism's water demands. A political ecology approach is used to understand how social power and ecology come together and result in inequitable and unsustainable water distribution on the island of Bali. Bali is an important case study because 80% of the economy depends on tourism and tourism depends on a healthy water supply. Following a month of interviews and a survey, a stakeholder map has been developed. The causes and consequences of Bali's mismanagement of water are discussed. The environmental and political factors that intersect and result in water inequity are already causing social conflict and environmental problems. In the near future they will begin to impacts on Bali's tourism and economy. **Keywords:** political ecology, water, Bali, conflict. © 2012 Elsevier Ltd. All rights reserved.

INTRODUCTION

Water essential to sustain life and livelihoods, is also essential for the health and happiness of tourists (Stonich, 1998; WTM, 2007). It is recognized as one of the most critical and scarce resources for the tourism industry (UNWTO, 2003) an industry renowned for its over-use of water. Frequently, local populations have to compete for this scarce but essential resource. This is often most apparent in the summer or dry season which also correlates with the tourist high season (Eurostat, 2009). In many tourism destinations water availability is reaching a crisis point and the impacts of tourism on the hydro-ecology are unsustainably high. Climate change will increase the pressures, and thus finding a way to manage water resources is critical. In developing countries the problems of water inequity are more stark due to the relative power differences between the different stakeholders; and management is more difficult because catchment areas are affected by

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deforestation; deficiencies in water infrastructure; absence of effective pricing and cost recovery systems; and lack of organizational and institutional commitment to apply financial incentives or sanctions to encourage water conservation (Pigram, 2001).

This paper takes a political ecology approach to provide a deep, nuanced and productive understanding of water inequity in Bali. It uses a political ecology approach to identify the key stakeholders in the water–tourism nexus and understand their differing perspectives on Bali’s water and its management. Social power is combined with a variety of factors that result in water inequity in Bali with significant costs. The paper examines the causes and consequences of the unsustainable and mismanaged tourism development for the fresh water supply on the island. Following a review of studies on water and tourism, the importance of tourism, and the hydro-ecology of Bali; this paper outlines the political ecology approach taken. After detailing the methodology used in the research the paper outlines the stakeholders of tourism and water in Bali. The interaction of environmental and political factors that have intersected in Bali and how this has affected the various actors is then explored. The approach went beyond just identifying water users but to look at the historical and social processes that have resulted in the pending crisis, and the levels of understanding, attitudes and actions required for more equitable access. The paper then considers the potential for further impacts of water mismanagement in Bali before considering policy issues. Three present policies are explored before suggestions are made for a re-orientation towards knowledge and rights based approaches to water management on Bali.

POLITICAL ECOLOGY OF WATER AND TOURISM IN BALI

The sustainability of tourism is dependent on an adequate water supply of sufficient quality and quantity but there is little research on the significance of water in tourism development (Essex, Kent, & Newnham, 2004). This paucity of research into the tourism and water nexus has made it difficult for the tourism industry to engage in the policy debate (Cruse, O’Keefe, & Horwitz, 2010). A distinction has to be made between the consumptive and non consumptive relationship between tourism and water. While the distinction may sometimes become blurred, it is the literature about potable water recourses for consumptive purposes and their management that is considered here. While respecting the importance of embodied or virtual water use such as in the construction phase of a hotel, in fuel use, or food production (cf. Gossling et al., 2012) such considerations are beyond the scope of this paper. Most of the research into the direct consumptive use of water for tourism that has taken place has been in the dry land regions of Australia (Cruse, O’Keefe, & Horwitz, 2010; Lehmann, 2009; Pigram, 2001) or in relation of the Mediterranean (De Stefano, 2004; Essex et al., 2004; Garcia & Servera, 2003; Kent, Newnham, & Essex, 2002; Rico-Amoros, Olcina-Cantos, & Sauri, 2009; Stefano,

2004; Tortella & Tirado, 2011). Despite access to water being a key indicator of progress towards achieving the Millennium Development Goals, the intensification of global concerns over water access and availability and the increasing importance of tourism in developing countries there has been remarkably little academic research into the link between tourism and the impact of water scarcity on destination populations. The exceptions include work by Stonich (1998) in Honduras; and by Gossling (2001) in Zanzibar. To date the only study on water resources on Bali has been produced by the Japan International Cooperation Agency (2006) but the references to the impact of tourism are negligible, despite the fact that tourism uses 65% of Bali's water resources (Merit, 2010).

Whether in the developed or developing world, water based images are used to promote a focus on indulgence (Lehmann, 2009) and the per capita use of water by tourists far exceeds that of locals (Crase et al., 2010; De Stefano, 2004). However, water consumption differs substantially, dependant on the predominant tourist land use patterns (Rico-Amoros et al., 2009) and the hotel type (Deng & Burnett, 2002; Gossling, 2001; Gossling et al., 2012). As Gossling (2001) demonstrates water use grows exponentially with increasing hotel size. As Crase et al.'s work highlights the water using behavior of tourists has significant infrastructure and planning implications, but there has been little behavior analysis, the focus has been on pricing and engineering solutions. Furthermore, despite the use of campaigns "little is known about the impact of campaigns to encourage water-conserving behavior while on holiday" (2010: 16). Furthermore, as Charara, Cashman, Bonnell, and Gehr (2010) work suggests educational outreach to managers and decision makers would probably be very beneficial due to low levels of understanding and awareness of water conservation.

Tourism and Water in Bali

Located eight degrees south of the equator Bali measures approximately 140 km by 80 km and has an area of 5,620 square kilometers. The island is Indonesia's most important tourist destination and represents the world's best tourism laboratory; the only Indonesian province whose territory embraces a complete island together with a language and religion that separates it from other areas. Bali has been promoted for tourism since Dutch colonial times. "More than any other tropical island, Bali has become the most exotic of exotic locations, a fantasy of all the splendors of the Orient and beauties of the Pacific" (Vickers, 1989:2). By the end of the 1930s tourists were arriving in their thousands (Picard, 1997). By the 1960s they were arriving in their 10s of thousand and by the 1980s in their 100s of thousands. It was subject to a United Nations Development Program Comprehensive Tourism Development Plan in 1972, and the Bali Sustainable Development Project from 1989–1994. Studies on Bali's culture (Bateson & Mead, 1942; Boon, 1977; Warren, 1998) and her tourism abound (e.g. Hitchcock &

Nyoman Darma Putra, 2007; McCarthy, 1980; McKean, 1978; Picard, 1996; Rodenburg, 1980; Vickers, 1989).

Still marketed as “Mythical and magical, . . . the spectacular volcanic mountains and lakes, enchanting rice terraces, ancient temples and palaces, surrounded by sparkling coral seas” (Dive-the-world, 2010) continue to entice tourists. In 2008 Bali hosted 4.7 million tourists (BPS, 2009). “Tourism has become an integral part of Balinese culture” (Picard, 1997) and economy providing 481,000 direct jobs, directly employing 25% of the work force and supporting a further 55% and contributing 30% of Bali’s Gross Domestic Product (BPS, 2009). However, all is not well in paradise. The tourism industry may have reached saturation, or could even be in decline (Kuntjoro, 2009) income from tourism has continually dropped since 2000 despite the continuing developments and a 50% increase in hotel rooms in three years (Kuntjoro, 2009). It is estimated that 85% of the tourism economy is in the hands of non Balinese (MacRae, 2010), and that tourism uses 65% of the water (Merit, 2010). While references to unsustainable use of water resources have been made in passing, no study has comprehensively examined the water–tourism nexus or its impact for Bali’s future.

In Bali water is important for maintaining a harmonious relationship among God, humans and the environment (Tri Hita Karana) a modern interpretation of Hindu-Balinese philosophy (Windia and Dewi 2011) that is sustained in rites of the water temples. As Lansing (2007) discusses, the agro–ecology has been controlled by an adaptive, democratic management system based on a unique social and religious institution—the *subak* system, and water temples. The self–governing, democratic associations of farmers managed the just and efficient system of sharing Bali’s water. While Straus (2011) argues the *subak* system was not fully democratic and that the kings in pre-colonial times acted in their own interests, the system did allow for a sufficiently equitable sharing of the available water. Since the 11th century the water temple network expanded to manage the ecology of the rice terraces at the scale of whole watersheds (Lansing, 2007). The water temples of Bali are still actively used and maintained by local populations but the *subak* system is endangered (Lorenzen & Lorenzen, 2011).

During Indonesia’s New Order era (1966–1998) the development agenda was to open up Bali to mass tourism. Tourism was a development strategy and growth came at any cost. The pace has been described as rapacious (Lewis & Lewis, 2009) and the figures speak for themselves. In 1987 deregulation of the banking system fed an unprecedented investment boom resulting in a 10 fold increase in foreign and domestic investment between 1987 and 1988 and almost doubled again the following year (Warren, 1998). Despite disquiet and growing protests over the exploitation of the island, outside investors and powerful government officials with links to Regents in Bali continued to get concessions (cf. Suasta & Connor, 1999 regarding the Bali Nirwana resort for example). Investment pressure, especially from Jakarta conglomerates, ensured the development policy was “almost entirely geared towards gross maximization of the number of tourists and income they

might generate. From 5,000 rooms in 1987, there were 13,000 in 1992 with a further 20,000 under construction” (Warren, 1998:233). By 2002 there were over 40,000 rooms (Nordholt, 2007). Regional government was complicit, eager to increase their revenue from hotel and restaurant taxes. Foreign money poured in—half of all foreign investment to Indonesia in 1990 was for hotel development (Warren, 1998). Bali’s mass tourism boom fuelled from the outside had a range of social and environmental consequences, the water crisis being just one.

International agencies (e.g. JICA, 2006) and local NGOs (E.g. WALHI) suggest Bali will have a serious water crisis by 2025 if water management is not made a priority. This is in part because Bali’s population is set to increase by at least 32% to over four million by 2025. This is in a large part due to migration; many migrants come to Bali in search of work. Most of the hard, dirty, dangerous and poorly paid work is done by migrants (MacRae, 2010). Furthermore, foreign tourist arrivals are expected to increase 150% between 2000 and 2025 although this maybe optimistic as they have not seen any significant increase up to 2010 \pm five million (BPS, 2010). However, these figures do not allow for the increase in domestic tourism which accounts for up to 70% of Bali’s tourism at some points in the year. Additional pressures will also come from increasingly diverse and sophisticated requirements for water to service tourist facilities for a more affluent and demanding clientele such as more air conditioning and the increasing numbers of spas and villas with their own pools and Jacuzzi (Pigram, 2001). Furthermore, star rated hotels are increasing in popularity (BPS, 2010).

A Political Ecology Approach

Political ecology is a broad based and fragmented field that has evolved and flourished. It is an analytical approach used across disciplines that combines political economy and cultural ecology (Robbins, 2004) and that provides trans-disciplinary frameworks that apply methods of political economy to ecological contexts (Gossling, 2003). In common with other political ecologists the author is concerned with social justice and linking research to action (Derman & Ferguson, 2000). It is a useful analytical framework to understand the impact of global political and economic process on local environments. It attempts “to understand how environmental and political forces interact to affect social and environmental changes through the actions of various social actors at different scales” (Stonich, 1998, p. 28). As Kutting (2010) suggests both structural and actor based analysis is necessary in political economy analysis and this is extended here to political ecology. In analyzing the complexities of societal-environmental change different groups of people are involved and academics have used a number of terms: stakeholders, interest groups, and actors. Their meanings and use overlap (Brown, 1998). They all refer to differentiated power, knowledge and agency and stakeholders is used here following Stonich’s (1998) use in this journal. Each stakeholder group is not monolithic; in fact the interests of individuals in each group

may diverge. However, stakeholder categorization began the task of identifying the networks and complexities.

There are four dominant narratives in political ecology research: degradation and marginalization, environmental conflict, conservation and control, and environmental identity and social movements (Robbins, 2004). However there is some degree of overlap between these central ideas. This paper is mainly concerned with environmental conflict, but also considers issues of marginalization and conservation and control. Political ecology is about struggles over resource access and control (Paulson, Gezon, & Watts, 2003). In Bali there is a struggle over access and control of water. As Swyngedouw (2009) suggests the mobilization of water for different uses in different places is a conflict ridden process and the organization of the flow of water shows how social power is distributed in a given society. “The political ecology approach traces the fundamentally socially produced character of inequitable hydro-social configurations” (Swyngedouw, 2009, p. 58). As with the political economy approach it focuses on how power and resources are distributed and contested to reveal the underlying interests, incentives and institutions that enable or frustrate change. It provides a bridge from hydrological science that can tell us what is happening to water processes, to the political, social and historical social sciences that provide an understanding of how and why the present situation came about. As nature and society are fused in inseparable ways an interdisciplinary approach to the inequity of water distribution is required. This paper examines the distributive (in)justices and outcomes of the environment and economic changes taking place in Bali. While seeking lessons that can be transferable to other destinations, it is accepted that the complex interactions between changing environment and society lead to culturally and historically contextualized conclusions (Derman & Ferguson, 2000). As political ecology approaches are used by both anthropologists and geographers it is surprising how little it has been used to examine tourism’s relationship with environmental and social change. In fact it is over 10 years since Stonich’s paper in ATR. As an anthropologist working in a geography department specializing in international tourism development it felt appropriate to return to the approach. Furthermore, as an action researcher a framework that advocate’s change in the management of nature and rights of the people (Robbins, 2004) was considered important.

Study Methods

In June/July 2010 a pilot research project to develop an understanding of the barriers to equitable water access in Bali was undertaken. The village of Canggu was selected for the research as it is a rural area that lies on the edge of the urbanized tourism zone that has, in the last 30 years, expanded North along the West coast of Bali from Kuta, via Legian, Seminyak, and Kerobokan and is now encroaching Canggu.

MAP <http://maps.google.co.uk/maps?q=map+south+bali&oe=UTF-8&ie=UTF8&hq=&hnear=Bali&gl=uk&ll=-8.673348,115.200577&spn=0.164607,0.263329&z=12>.

A multi-method approach was used involving interviews with villa owners, *subak* heads, community leaders, local NGOs and government departments; questionnaires to tourists, and focus groups with community groups. This multi-method approach was appropriate for multi stakeholder research that required significant adaptability in the field. The methods had been used previously in Indonesia with considerable success (Cole, 2006). The research was designed to map the stakeholders; to estimate the water usage of the different stakeholders and how this results in water conflicts; to discover the level of understanding that exists among the stakeholders about the problem and the actions that they are presently taking; and to understand the tourists' knowledge and understanding of their water impact, the pending water crisis, and how far they would change their behavior if they were aware of it.

Between 22nd June and 29th July 2010 thirty nine interviews/focus groups were conducted and 110 tourists were surveyed. The participants of the interviews were: eleven government departments, four NGOs, four academics, three tourism industry associations, Aqua (bottled water company, owned by Danone), Coca-Cola, a developer, an architect, two hotels, four villas, a business man/ expatriate activist, a restaurant, a laundry, a spa, two community groups, plus individual community members and a *Pekaseh* (democratically elected head of a *subak* irrigation system). A Balinese research assistant was invaluable to the entire research project. She acted as a "fixer", arranging appointments and ensuring we spoke to relevant people in the right government departments. In all cases this was head or vice head of government departments. All but two of the interviews were conducted in English or Indonesian (which the author speaks fluently), or a mixture of the two; however two interviewees chose to speak in Balinese and the research assistant translated.

THE WATER AND TOURISM NEXUS STAKEHOLDERS IN BALI

Stakeholder identification was the first step in unpicking the political and economic context in order to fully appreciate the human-environment interactions and specifically the tourism development–water interaction. Stakeholder identification is the first stage in stakeholder analysis but here it serves the purpose in allowing for the identification of different groups, prior to an analysis of their values, interest and uses. It is a first step in understanding the networks and complexities that have led to Bali's water mismanagement. Figure 1 is a diagrammatic representation of the stakeholders involved in the water tourism nexus in Bali. While this is particular to Bali it could also represent a model for the examination of water and tourism in other destinations. It demonstrates the linkages and the vast array of stakeholders in the government. It should be born in mind that for many of the govern-

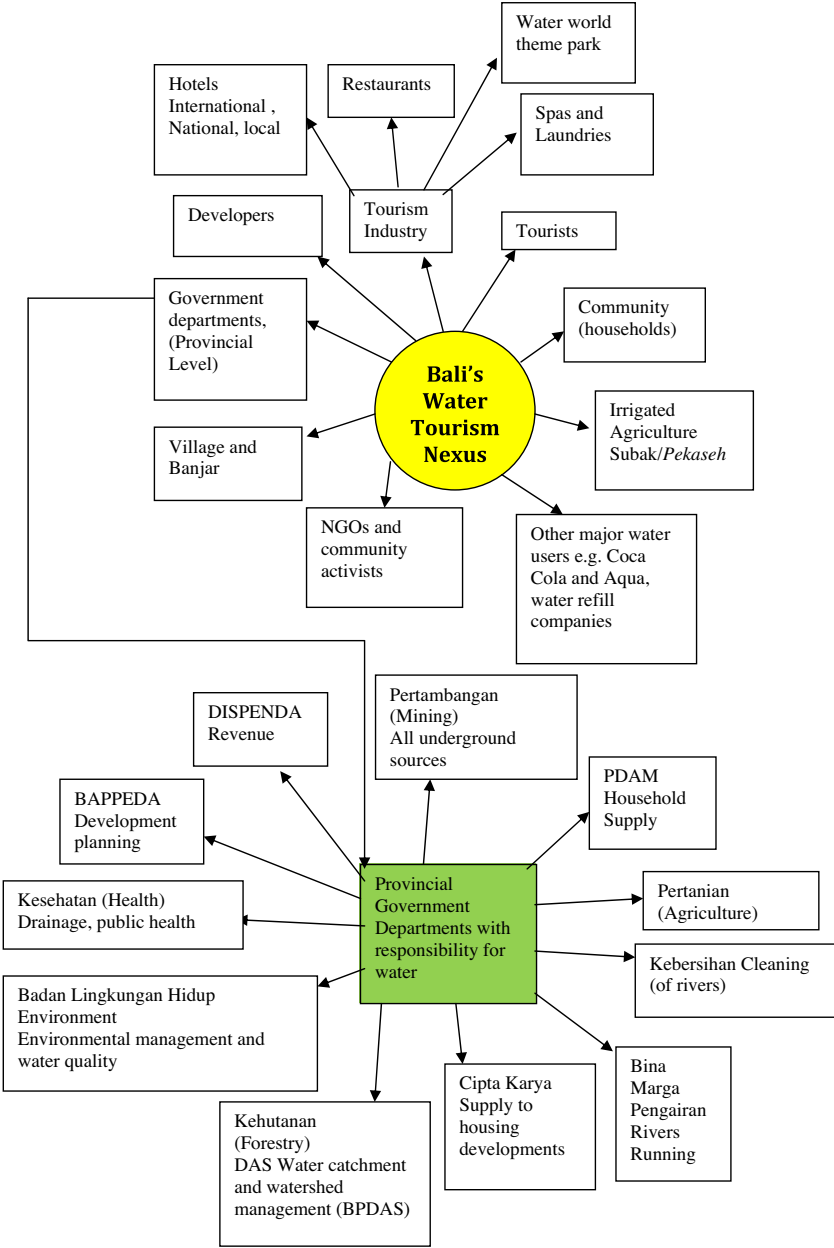


Figure 1. The Stakeholders of the Water Tourism Nexus in Bali

ment stakeholders they are represented at three levels: National, Province and Regency, with considerable friction between the different levels. The next step would be the represent the relative power of the different stakeholders, and the interconnections that exist. For exam-

ple, some government officials are also owners of properties, and some developers have stakes in National government departments etc. Furthermore, international actors would add another layer to be examined. The separation of *Banjar* from households is probably a uniquely Balinese distinction. A *banjar* is a traditional neighborhood that is a territorial, social and cultural unit (Hussey, 1989). Only Balinese belong to these physical and conceptual organizations or *Banjar Adat*, not the immigrants from other islands and Nations. Under normal circumstances, you belong to your father's (or husband's, when you marry) home *Banjar* even if you are living in a completely different part of Bali. However, *Banjar*'s have a significant impact on local level decision making. While water to irrigate agriculture is likely to compete with tourism in many destinations, the role of *subaks* and their importance may also be peculiar to Bali, their mandate is both in water management and rituals and they are important social networks. However, as MacRae and Arthawiguna (2011) suggest they are neither homogeneous nor necessarily harmonious and their internal workings are contested.

THE CAUSES AND CONSEQUENCES OF BALI'S WATER MANAGEMENT CRISIS

Based on a synthesis of the primary and secondary research, and accepting that the empirical data are preliminary, it is clear that Bali's water crisis results from a number of interconnected factors, each of which is discussed below. Environmental and political factors that intersect and affect different social actors in different ways but that result in the distribution of water being skewed away from agriculture to tourism; and inequitable shares between tourists and locals. The mobilization of water in Bali for different uses by different groups is indeed a conflict ridden process.

Water Supply Factors

While the government, or a quasi government private-public partnership, attempts to provide piped water to households and the tourism industry, the supplies are woefully insufficient. Although 64% of households in North Bandung (the northern section of the Regency in which Canggu lies) are connected, water does not necessarily flow down the pipes or the pressure is extremely weak. Some households reported "catching drips all day to collect sufficient to bathe", others that "Our water flows for two hours in the morning", and others said that "water only flowed on some days" or "sometimes". All hotels, villas, restaurants, laundries, spas etc therefore have wells with electric pumps (bored wells *sumur bor*) even if they have piped water, and so do many households. The use of wells in and around the research area revealed five important issues: Firstly, none of the villagers had piped water, all had wells some had hand dug wells which normally go to a

depth of 12 m. Villagers reported that these “were dry” “were dry sometimes”, or “were dry during the dry season”. In dry period’s villagers without a bored well were reliant on neighbors or had to purchase their water. Secondly, all tourism establishments had bored wells with pumps. As they ran businesses they should have a permit for their wells and the water taken should be metered and paid for. In all the facilities researched only one had a metered well and paid for the water used. All the other wells were “illegal” i.e. without being registered and without the water being paid for. Most respondent were, or claimed to be, unaware of the need to have a permit and meter. As one villa owner told me “I am totally unaware of the need for a permit”. Thirdly, nearly all the wells were 60 m deep. The Department of Mining assured the researcher that salt water intrusion was not a problem because “all bored wells are shallow” (which he went on to explain was less than 40 m). All those respondent with wells that were only 40 m deep reported lime as a problem which affected the machinery such as swimming pool pumps, washing machines etc. Fourthly, as bored wells are not registered and the water not metered no-one has any idea how much water is being taken from underground supplies in Bali. As the head of the Department of Mining is unaware that new wells all go to a depth of 60 m the salt water intrusion that academics have suggested is a problem may well now be widespread. And finally, nearly all respondents believed that they paid for water through electricity bills because of the use of pumps. Whenever water conservation was discussed the reason was to save on electricity bills. “We are interested in water saving for cost saving” one hotel engineer responsible for water in a medium sized hotel, told us. Another said “water saving equals electricity saving”.

Political and Regulatory Factors

As can be seen in the stakeholder map, the responsibility for clean water in Bali falls to eleven different government departments. Each department is represented at different levels in the Indonesian government system: National, Provincial and Regency. National level departments set rules that should be followed at Provincial level, who themselves follow and make rules to be enacted at Regency level. However, since 1999 Indonesia gave the Regencies autonomy so they frequently make their own rules and refuse to abide by rules made higher up in the administrative system. “Regency heads (*bupati*), unfortunately, can and often do ignore the provincial government in important matters such as coordinating a sustainable approach to resource management and tourism development” (Reuter, 2011, p. 64). The result is plenty of rules but nobody taking responsibility to enforce any of them. Nearly every respondent from village to head of government departments told us that the problem is “weak law enforcement” “lack of control over law breakers” “regulations do not function” “supervision is weak” or that “laws are not implemented”. Having eleven departments with different responsibilities

and interests means that coordination across departments is a challenge. Furthermore, each department desires ownership (and potential funds) of all projects and therefore resists sharing information with other departments. They each make their own plans, and their own rules. This ‘*sector-centric*’ behavior of the different departments involved was particularly apparent in relation to watershed management. When the Department of Forestry set up a watershed management group (BPDAS—*Balai Pengelolaan Daerah Aliran Sungai*) the Department for the Environment also set up a water stakeholder forum. Meanwhile the Department of Public Works set up a watershed management forum. There are three different groups that all try and get the various government stakeholders together. The Department of Forestry group is least well financed but is the only group to invite non-government stakeholders to attend.

The number of different departments and different rules is used as a reason or excuse to not follow the rules. Indeed for many it is difficult to find out which rules to follow. Taking well permits for example: who is required to have a permit, at what stage they should apply and to whom? We asked the head of the department responsible, the Department of Mining, he told us, “Any commercial venture must have a permit, but that doesn’t apply to *warung* (little food stalls), we have a sense of humanity (*manusiawi*). Many large restaurants are now called *warung*. Warung Made is one of Bali’s premier restaurants with several outlets. The same problem of use (or deliberate misuse) of terms occurs with “Villa”; a villa originally assumed as a private house that is sometimes rented out, pays a lower premium for water than a star rated hotel or even a guest house. However, as the head of the Bali Villa Association told us “Anything can be a villa”. The research revealed villa could mean tourism accommodation with 70 rooms, each with their own swimming pools (charging US\$750/room/night)!

Social Power and Cultural Factors

While the problems of ineffective governance were openly discussed by nearly all stakeholders, most very readily found excuses for their seniors or those in higher social positions. While grumbles were expressed, there is little open protest. As with other places in Indonesia “concepts of power and authority, whereby reverence towards people in power or otherwise high social standing, prevail” (Cole, 2008, p. 41). Indonesia is a collectivist culture that stresses deference and harmony which means individual behavior is regulated to ensure peace and order in the social domain, unity of the community is guarded by restrictions to individual freedom (Kling, 1997). The authorities make decisions and they cannot be questioned. Villagers accept and expect political and social control to be in the hands of the government. They are taught blind obedience to central government (Erb, 2000), and there is, or has been, a belief that the government knows best (Gede, 2000). This culture of respect and reverence of people in high social standing means that the Balinese lack criticality, they

do not protest about their lack of water to the government and instead the conflict is turned on one another (see below). Furthermore Bali is a highly stratified society. Family origins, defined through a conventional caste naming system, are respected and constantly present. And the patriarchal nature of Balinese society places women below men. While women, from lower ranks are the most likely to be impacted by water scarcity—to feed, wash and prepare food for her family, they will have the least opportunity to voice their concerns for fear of bringing disrepute or not showing respect. People in Bali are often frightened to protest as in some cases protesters have been threatened (WALHI, 2010). However, there is also evidence that village-based resistance can be successful (Nordholt, 2007).

Awareness Factors

While government stakeholders are aware there is a water problem, many are not aware of the extent of the problem- in fact it is unclear if any one stakeholder has sufficient information to have a true picture of the problem. The partial knowledge among government stakeholders has been discussed above. Most of the tourism stakeholders were unaware of the need to conserve water or of basic socio-hydrology. One of the villa owners admitted to choosing an umbrella shower for aesthetic reasons, in reference to the showers water use he said, “I didn’t even consider it, until an Australian guest said that such showers were illegal in Australia”. Another villa manager could only name dual flush toilets as water saving devices he was aware of. More than 50% of the tourists reported that their towels were changed every day and less than 20% of tourists surveyed had noticed their accommodation making any efforts to conserve water or encouraging tourists to do so. However, 95% of tourists thought they should. The pressure to change is unlikely to come from tourists as nearly 90% of the 110 tourists surveyed thought Bali had plenty of water. Encouragingly, nearly 70% said they would make an effort to conserve water and wanted more information to help them, while 36% would be prepared to pay an environmental tax on their bill to help save water and a further 12% would make a voluntary contribution.

Environmental Development Factors

Deforestation continues particularly in the mountains where the remaining forest cover is essential to protect the mountain springs and to act as a sponge for the rain. During field visits developments (of hotels) in protected forest areas were observed, including a 400 room “villa” complex. Other developments are also unsustainable, for example the law states that no building should occupy more than 40% of any plot (the remaining 60% should be garden). However, this law is misunderstood (several respondents thought a swimming pool was “garden”) and/or ignored. The constant over-development and

paving of land results in run-off and rainwater, which is needed to refill underground supplies, flowing into drains, ditches, rivers and out to sea. Furthermore, despite certain areas having greenbelt designation, a combination of ignorance of the law and ignoring the law means that development continues unabated through-out Bali. Research conducted in the village of Canggu, most of which is designated Green Belt confirmed the ignorance and or deliberate ignoring of the law and a variety of reasons that the villagers were giving up farming and were building instead.

Land-use Factors

Farming is in decline for a complex of factors. The move away from agriculture is part of an emergent trajectory of agrarian change in South East Asia, “the younger generation are unwilling to ‘work in the mud’ anymore and the farming community is aging” (Lorenzen et al., 2011:40). The conversion of paddy to buildings connected with the tourism trade and the pressure to divert water for tourism uses combined with the low income from rice farming means that “planting concrete” rather than crops has tempted farmers to build or sell their paddies for building. Approximately 1,000 ha of rice terrace is lost each year (Ministry of Culture, 2009). The reasons the respondents gave for giving up farming included: unaffordable land taxes as they are set at the saleable value of land. If a farmer’s agricultural land lies next to a plot that has a villa on it (rented out for \$1500/night see http://cangguvillasonline.com/canggu-villas/feature/beach_front/4/ or <http://www.hotcangguvillas.com/> for examples) then the taxes charged make agriculture uneconomic. Furthermore, Bali has experienced unreliable weather patterns for three years. The unpredictable rains have made harvesting difficult or impossible. Many respondents suggested this was the impact of climate change on Bali. Polluted water sources were a further reason. As one rice farmer complained “picking rubbish from the fields is a horrible part of my work...it is getting worse...more and more plastic waste is ending up on my fields”. They also complained that they got itchy conditions from the *sawah* (irrigated rice fields) water which they put down to pollution. When some farmers sell up, the birds have smaller areas to feed on, posing a greater burden on those that continue. Many said that bird scaring was taking up unreasonable amounts of time or that they were losing too larger proportion of their rice to the sparrows. Some respondents who had sold their land had done so due to continuous pressure from developers. Finally, there is a vicious circle of ending agriculture and tourism development. The villagers of Canggu listed the functions of wet rice fields as “views”, “beauty”, and “conservation” as well as livelihood. They believed it was inevitable that they would eventually all sell their land and their children would work in tourism. Some rice land would survive, they thought, because some villa owners bought adjacent land and paid the farmers to keep planting rice—to maintain the views. Wet rice cultivation symbolizes the “Balinese lifestyle” (Straus, 2011) it is

part of the Balinese “ecological identity” (Gossling, 2003, p. 9), it is important for thinking about cultural identity (MacRae, 2005), the loss of paddy is the loss of a way of life as well as a traditional landscape with aesthetic value for tourism. Indeed UNESCO, (World Heritage Convention, Cultural Landscapes) is considering a proposal for a “cultural heritage landscape” which if successful will “protect an area of the wet rice farming system in Bali” (<http://whc.unesco.org/en/tentativelists/5100/>)—perhaps resulting in the museumification of the livelihoods for some Balinese.

THE STRUGGLE AND CONSEQUENCES FOR LOCAL PEOPLE

All the impacts of over-use of ground water by the tourism industry are being felt in Bali: a falling water table, salt water intrusion, land subsidence and deteriorating water quality. The Environmental Protection Agency (BLH) has recorded salt water intrusion into the ground water supply. According to the environment agency ground water in the most popular resorts in South Bali is “unfit for human consumption” (Ketut, 2007). Meanwhile 260 of Bali’s 400 rivers have run dry and Bali’s biggest natural reserve of water, Lake Buyan, has dropped 3.5 meters in three years (Fogarty, 2007). However as there is a time lag between the pumping of ground water and the impact, and as damage in one area will affect the rest of the system but knowledge of the inter-relationships between human actions and the extent and timescale of ground water degradation is lacking (Theesfeld, 2010) the consequences are felt in a range of ways. The research uncovered a number of struggles and consequences for local people as follows:

The competition for water is felt greatest in agriculture. This causes a variety of conflicts for rice farmers whose cropping patterns are upset or who are only able to plant rice once a year (traditionally they have planted two crops a year). It causes conflict between those that manage the water (*Pekaseh* on behalf of the *Subak*) and the village that allows tourism development, or sell water to the bottled water refill operators. The vice head of the Bali Tourism Board spoke of his worry that tourism was competing with farming and the consequences this will have. More than half the water from a new reservoir built in Tabanan to support the wet rice farming is diverted to South Bandung for tourism. (Prof Merit Interview). The Indonesia Regional Autonomy legislation allows Regencies to manage their natural resources, which includes water. Indonesian Law (no. 7, 2004) on water resources gives access for privatization and this has led to Regencies with water resources putting a tariff on water use, to add to their revenue (*Pendapatan Asli Daerah*). This leads to conflict over water resources especially when rivers run across regencies and a number of conflicts have also broken out between villages and *subaks* (WALHI, 2010). Instead of protesting about the mismanagement to the government, the people fight one another to secure their water source.

The purchase of drinking water (aqua) by the gallon began in Bali in the early 1990’s. The price of this relatively new but increasingly dom-

inant, for the middle classes, supply of drinking water is now Rp 12,000 (\$1.30) per gallon, an increase of 25% in 3 years. While unregulated “refill” drinking water appeared on the market about 10 years later and costs about Rp 4,000 (\$0.5) in South Bali. However, it is reported that in other areas, such as in Nusa Penida and Kubu Karangasem the prices for clean water can be as high as Rp 50,000 (\$5.80) per gallon (Renon, 2010). The cost of household connection to piped water in Badung Regency is Rp 1,720,000 (\$185) plus the cost of pipes from the property to the nearest supply. These fees are unaffordable to many farming households (Straus, 2011). Furthermore, in the capital Denpasar PDAM is unable to meet demand with a waiting list of 5000 households (Atmodjo, 2010). In July 2009, the government of Bali through its Governor Decree No. 16 Year 2009 increased the price on water (underground water and surface water) by 1000% (Kencana, 2010a). However, due to objections from industry, particularly the tourism industry, to pay, the government reduced the increase to 500% until the end of 2010. Almost 90% of hotels refused to pay their water bills (Kompas, 2010).

Drinking so called “refill” water (*isi ulang*—because it generally means refilling a gallon Aqua bottle), which is purchased from unlicensed operators, sells for a third of the cost of Aqua. However, this water is not tested and therefore is of unknown quality. The choice to consume refill water increases the risk of diseases. The villagers who buy refill gallons for drinking purposes spoke of increased cases of diarrhea. They said “Sometimes there was mud or worms/larvae in the water”. According to the Health Ministry a high proportion of infant and toddler deaths are caused by diseases related to poor sanitation, water and environment. Bali has a higher prevalence of diarrhea (13%) than the national average (9%) (Nampira, 2009), despite being one of the most economically prosperous provinces (MacRae, 2010). According to local academics interviewed, beaches on the southern part of Bali are polluted. This endangers surfers and swimmers for many water-related-diseases such as ear infections (Kencana, 2010b).

FURTHER IMPACTS OF WATER MISMANAGEMENT

As Hoekstra (1998) discusses water is not a renewable resource, if populations are reliant on ground water which may become too polluted to be used or may become depleted and result in salt water intrusion. Bali’s declining water tables are a signal that water withdrawal is exceeding the groundwater resources. The struggles and consequences above represent the consequences of unsustainable development and mismanagement of Bali’s water resources to date. The worst impacts affect the poorest and most marginalized members of society first. Those whose hand dug wells have run dry but cannot afford to be connected to state water supplies, and have to buy polluted refill water; or those who have lost their land to the capital intensive development projects fuelled by Jakarta elites; those that live in areas where the drainage cannot deal with the run-off from buildings and roads, as a consequence of

over-development, and constantly live with flooding of their homes. We must question however, how long before the rest of Bali and indeed all the investors will begin to share the pain. Mass tourism is a water intensive industry, and the level and pace of continued development in Bali cannot be sustained.

POLICY IMPLICATIONS

Water scarcity in Bali is a socio-political phenomena and the solutions lie in policy and management change. Considering first the policies that have been introduced, clearly the commercialization of water has begun. As Bakker (2003) suggests, public-private partnerships, such as PDAM, turn water into a commodity to be sold to consumers at a profit. The residents have become consumers who purchase a commodity rather than citizens with a right to water. However, we have seen that the commercialization of water has been met with fierce opposition from hoteliers who have refused to pay the price increases. This highlights the power of the tourism industry in Bali. The second policy initiative is the compulsory use of “*biopuri*” or water absorption holes. Whilst this is a sensible initiative, particularly in its role to prevent flooding it is unlikely to be successful in dealing with the pending crisis. Rain-water catchment has a far greater potential for providing for Bali’s tourism and domestic needs and a policy on this is overdue. Furthermore, it should be born in mind that issues of environmental governance exist not only at the policy level but also in implementation (Kutting, 2010). In Bali there are implementation gaps at every level of government. A third policy initiative, that has come from the international arena: UNESCO, is the designation of an area of Bali to become a World Heritage Landscape. This initiative may have the result of preserving part of Bali’s wet rice agriculture and the aesthetics, landscape and tourism that goes with it. However, as Robbins suggests, when control of the landscape is wrestled away from local producers and “turned from landscapes of production into commodified landscapes of tourist consumption” (2004, p. 148), local systems are frequently disabled and shown to have pernicious effects and sometimes even fail. While an international organization may have more success at governance it will have to work with National, Provincial and Regency level agencies any of which have the potential to frustrate the plans.

The research revealed a lack of knowledge was common to nearly all stakeholders in Bali’s water-tourism nexus. A major public education program, targeted at the different user groups, would therefore seem an important and obvious policy initiative. With knowledge there is a hope of collective awareness and then collective action. Agriculture needs to be supported, coupled with the recognition that water has functions outside market forces and provides a range of services to society beyond purely food production. The role of water in Balinese landscapes, aesthetics, ritual, culture, social networks, and of course tourism must be recognized and supported. As Derman and Ferguson (2000) explore contestations between economic interests, rights based

interests and environmental ones often lie at the heart of political ecology studies of water. The author would like to propose taking a rights based approach to water management would, if combined with a major awareness program, be the most effective policy for all the stakeholders involved.

CONCLUSION

Through the examination of the causes and consequences of water inequity in Bali this paper has outlined how social power is distributed in modern Balinese society. It has revealed how an ancient system that ensured the equitable distribution of water resources that lasted for a thousand years has largely been displaced. Outside investors, with the support of all levels of local government, have driven unsustainable development with no regard for water resources. A political ecology approach has proven itself as a highly effective approach to unraveling the stakeholders, the historical process and politics behind the tourism growth and the impact this has had on hydro-social configurations and the barriers to a more equitable distribution of water on the island. The large and complex stakeholder picture surrounding the water-tourism nexus was developed to facilitate the analysis. The stakeholder picture is a model and thus an over-simplification of reality. A large proportion of Balinese have a foot both in agriculture and tourism. Members of government departments at all levels are also owners of a variety of tourism related businesses. The friction that exists between departments and layers of government is also not evident in the diagrammatic representation. The model does not show the relative power or agency of the various stakeholder groups which is in any case highly variable. The *subaks*, for example have the potential to exercise social power but this is very dependent on the individual *pekaseh*. What is clear is that both international and local businesses are able to bore to ever greater depths to access underground water supplies and pay for private supplies while the poorer marginalized population find their hand dug wells have run dry, and piped/bottled supplies unaffordable. As previous studies have shown (Robbins, 2004), those worst affected are the marginal communities at the fringes of social power, with little bargaining strength at the market, and little force in the political process. Furthermore, it is women who usually bear the brunt, as they are responsible for providing their families with water for domestic purposes.

The approach allowed for the multi-layered factors to be unpicked to reveal the social, political and environmental factors which together are leading to the mismanagement of water in Bali and the pending water crisis. As a result of ineffective water supply, policy and governance water extraction rates are uncontrolled and unsustainable. Furthermore the part privatization of Bali's piped water supply has led to increased inequality and restricted access for the poorest sectors of society. Power asymmetries combined with social and cultural factors mean that the Balinese lack criticality and despite resentment of the

government, conflict has appeared between villagers rather than being directed at the power holders.

A political ecology approach uncovered ignorance at all levels from tourists, the hotel and restaurant industry and in government. Positive change to protect Bali's dwindling underground resources is also hindered by overlap and 'sector-centric' interests between and within government departments; a propensity to produce but not follow rules and a lack of law enforcement. A rights-based approach coupled with a public education campaign are proposed as policy initiatives to bring about a more appropriate sustainable and equitable system to manage Bali's water resources.

Perceptions of the environment are a product of the social and cultural experiences and values. The political economy of tourism growth is causing conflicts; conflicts for society, for the environment and ultimately for tourism, upon which 80% of Bali's economy depends. There are parallels between this study and that of Stonich (1998), based in Honduras over 10 years ago. Unchecked tourism development jeopardized the Bay Island's fresh water resources. The degradation was attributable to powerful outside stakeholders who benefited most from the tourism, while the negative consequences were felt most by the local people. This paper has contributed in showing how once again power relations provide a key to understanding tourism's environmental impacts. The paper has provided a framework for further analysis of water-tourism nexus stakeholders, at least in the case of island states. **A**

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