

## Making an impact on Bali's water crisis: Research to mobilize NGOs, the tourism industry and policy makers

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### ARTICLE INFO

#### Article history:

Received 24 February 2020

Received in revised form 28 October 2020

Accepted 28 November 2020

Available online 28 December 2020

Associate editor: Bob Mc Kercher

#### Keywords:

Research impact, tourism-water nexus

Bali

Scholar-activism

### ABSTRACT

This paper explores the role of activist-academics to bring attention to Bali's water crisis. The impact case study examines how we shaped public discourse, supported NGOs, influenced the local tourism industry, and nudged government policy. We critically evaluate how as change makers we enhanced knowledge exchange, and the factors that supported impactful tourism and water nexus research. We explore how the unintended consequences of our "crisis" research have undermined our impact by being used to justify new unsustainable development projects, and how the power of the tourism industry has shaped legislation. From this we identify the lessons learned for creating impactful research including purpose, partners, time frame and on-going contact.

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### Introduction: research with impact

Research with impact is a prominent feature of the academic institutional landscape. This impact must be both within the academy, as the 'significance, quality and rigour' of our papers form part of official university evaluations. This now has to be combined with impact beyond academia and the production of demonstrable contributions to society and the economy. In the UK this has been delineated as "an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia" (REF, 2018).

The impacts of research can be specified as local, regional, national or international, and may be considered in relation to products, processes, behaviours, policies, practices; and/or avoidance of harm or the waste of resources (Font et al., 2019). Demonstrating this and how it can be evidenced is a matter of debate for tourism and social science research (Ferguson, 2014; Thomas & Ormerod, 2017). The beneficiaries can be individuals, groups of individuals, organisations or communities whose knowledge, behaviours or practices have been influenced (REF, 2018). While evidence suggests that tourism research has had limited high impact, this paper will outline the multitude of impacts of research first published in this journal in 2012, has had. It explores how and why a shoe-string budget research project can have far reaching impacts on the one hand, and the limits to the potential impact of political ecology tourism research, on the other. This paper explores the factors that led to impactful research and the reasons for the limits to that impact.

There are multiple challenges in producing and measuring evidence of something as nebulous as impact (Field, 2013) and this is especially so in the social sciences (Ferguson, 2014), which is generally underappreciated, partly because we know little of the processes of how social science influences wider decision-making (Bastow et al., 2014). "The process of research moving from the

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academic domain into policy and practice is neither straightforward nor well-oiled" (Cherney et al., 2015). Social science outputs while rarely commercialised can challenge people to think differently and create positive change. According to Bornmann (2012), this includes the contribution of research to national social capital, stimulating new approaches to social issues, or informing public debate and policy-making. However, social processes operate in complex environments and researchers find difficulty in demonstrating their individual influence on multi-causal policymaking processes. Furthermore, societal impact often takes years to become apparent, and "[t]he routes through which research can influence individual behaviour or inform social policy are often very diffuse" (Rymer, 2011). There are limited studies that explore research utilisation in the social sciences (Cherney et al., 2015). In tourism, very few studies report on the impact created by previous publications and interventions (Font et al., 2019). This paper answers that call. The research itself did not cause changes, but that it sowed seeds and the researchers acted as change makers and knowledge brokers who, with mediators, have catalysed change. The paper also explores the conditions that supported and undermined the use of the research and importantly the factors that enhanced knowledge translation and uptake. In doing so, we identify key learning points for impactful activist-academic research.

Bali has had a growing tourism industry since the 1930s and now supports 68% of Bali's economy and employs more than 50% of the population (Antara & Sumarniasih, 2017). Increased tourism has influenced to land use changes especially in the south of the island (Rimba et al., 2019) and increased water demands. These changes impact water supply and demand in Bali. According to Sunarta and Rahman (2015) between 2009 and 2013 the districts of Bali where water demand outstripped supply increased from five to eight of the nine districts. Various authors from different disciplines refer to a water crisis in Bali (Eryani & Jayantari, 2019; Rimba et al., 2019; Sunarta & Rahman, 2015). In this paper, we will trace the origins of research about Bali's water crisis, subsequent research initiatives and explore the potential impact of tourism scholarship. Specifically, we analyse how the research raised awareness, changed the focus of NGO priorities, and influenced government and the tourism industry. We critically examine the extent to which academic activists can influence change through the evolving story of Bali's water-tourism nexus, the competing "crisis" narratives, and how the commodification of water is now a consequence of Bali's tourism development.

### *The original research*

The original research, published in *Annals of Tourism Research* (Cole, 2012) highlighted the excessive and unregulated development of new hotels and villas in South Bali and their overuse of water, have caused a falling water table, salt water intrusion, and deteriorating water quality. Water was diverted out of agriculture with wider socio-environmental impacts (food sovereignty, culture, landscapes etc.). The complex array of stakeholders involved in the tourism-water nexus with overlapping mandates between government departments and between tiers of government. Most tourism stakeholders were unaware of the level of seriousness of water scarcity and the need to conserve water. Further analysis applied a socio-ecological systems framework (Cole & Browne, 2015), suggesting that the transience and fluctuation of resource users associated with tourism should not be underestimated. The tourists and tourism investors/developers consume water resources, but are not directly affected by water shortages. Furthermore, Bali's water users are too numerous and too diverse for effective communication and knowledge sharing thus the lack of awareness of their cumulative impact on the resource system. The analysis also pointed out that in Bali, "the hydrological system (including catchment areas, aquifers, etc.) isn't constrained within the boundaries of Regencies, therefore management shouldn't be constricted to these autonomous institutions". We regarded the lack of knowledge as a key barrier, and more sensitization of tourists, local people, industry and government, was regarded as a necessary step forward. One of the key conclusions of the original research was a lack of awareness of the problem in Bali. We designed the activism that followed to develop that awareness and seek solutions.

### *Further research*

This paper seeks to identify impacts from research that initially began in 2010 (published in 2012) and subsequent follow up research initiatives that took place in 2013–2014, 2015, 2017, 2018 and 2019. The original research project was conceived while the first author, a white western woman, was working as chair of Tourism Concern and saw a news piece by the second author, a Balinese man, who was head of the local branch of WALHI (Wahana Lingkungan Hidup Indonesia/Indonesian Friends of the Earth). The Al Jazeera film (<https://www.youtube.com/watch?v=kQaUGcOgbuk>) stimulated her application for funding. The third author, a Balinese woman, was the research assistant in the original research and her career has developed since. Tourism Concern and WALHI are campaigning organisations, and the authors are activist academics. Since its inception the authors have wanted to initiate and sustain change. The insider/outsider positions of the researchers has been significant. The first author was frequently told that her voice was needed, foreign voices have more credibility, and she would be listened to because she was foreign. This reflects what Gouda (1993) has described as the *inlander* mentality, and when extended to contemporary Bali, relates to the influence that foreigners can have in shaping decisions. On the one hand, foreigners are perceived to have greater power and understanding in shaping relations with the global market, while on the other hand, there is the sense of inferiority of the *inlander* not knowing as much.

The 2010 research identified that Bali was at risk of having a water crisis, which began to shape public discourse. We have since attempted to track and understand to what extent the research meaningfully affected water management considerations. In 2013–2014 the second author's research focused on governance and contestation of natural resources. In 2015, the first author, responding to a request to provoke action held a seminar called "Is Tourism Killing Babies?" This caught the attention of the

media and was substantially reported in the local press (Bali Post, 2015; Muhajir, 2015; Suryani, 2014). In 2017, a follow up multi-stakeholder workshop was organised by the first and third author to better understand the various concerns across the stakeholders. In 2018 interviews were held with 30 hotels and homestays and 5 government agencies. In 2019, we followed up with key stakeholders asking if Bali has a water crisis, and subsequent changes in water management. The research included three focus group discussions with hotels, homestays and tour operators and interviews with government agencies (9), consultants (1), NGOs (2), and other academics (2).

Table 1 describes the research and activism timeline including the key goals and findings, and the impacts. This is represented graphically in the network diagram in Fig. 1.

## The impact of the research

### Impact on NGOs

Two NGOs: I am an Angel Foundation (IAA) and IDEP foundation have changed or refocused their programs since reading the original research. Since 1999, the IDEP foundation, funded through donations and grants, delivers community education and environmental training programs. One of their programs: the Bali Water Protection Program was underpinned by the original research (Goalbre, 2014, pers. comm.) and launched in 2015 in collaboration with Polytechnic Negeri Bali. They called “on all Balinese civil, business, political and spiritual leadership, to take action in saving and protecting Bali’s freshwater”. Their awareness raising campaign and pilot project included education through bi-lingual comics, teachers’ aid posters, ‘how to build your own well’ manuals and a film “Adopt Water”. The program has attracted support from the Governor of Bali.

IAA has been working in Bali since 2003 to empower local communities as they cope with resource scarcity and socio-economic challenges. It raises money through events and private donations. The first author worked with the founder throughout the research. IAA used the papers as the base of its work related to water and human rights. IAA’s “Bali Water Public Education Strategy 2015–2016 were inspired and based on Dr Cole’s paper”. “Through continuous collaboration and communication with Dr Cole, IAA has been leading a campaign on issues related to tourism, water and human rights” (Lengkong, 2014, pers. comm.). Some examples of IAA work to raise awareness are: classes of citizen journalism on water conservation, a positive YouTube campaign “Water I am with you” <https://www.youtube.com/watch?v=U1nEvONc0wg>. Furthermore collaboration with several well-known artists to raise the issues with different audiences. For example, Cok Sawitri performed a monolog related to water; and Ida Ayu Arya Satyani choreographed a dance.

### Impact on tourism industry

The original research suggested that the hotel sector bore substantial responsibility of the overuse of groundwater and the consequent water problems on Bali. In 2010 there were 42,908 registered hotel rooms in Bali (BPS Bali, 2012: 13), this had increased by 154% in 2018 with average occupancy rates of 36–65% (BPS Bali, 2019: 356–375). Average water use per occupied room in Indonesia is 1860 l (Cornell Hotel Sustainability Benchmarking, 2019). There has thus been a significant increase in water demand and the response from the hotel industry has largely been slow and limited. However, increased awareness has led to some actions. Active communication has been maintained with the Bali Hotel Association (BHA) whose members have been encouraged to submit their data on water usage. By 2016, 92 out of 140 members submitted their data on a monthly basis and received data consolidated by a third party in return to use for benchmarking. The BHA encourages its members to raise clients’ awareness on water shortages and on how to reduce water usage. Our research suggests Bali’s hotels spend 5–15% on water; hence, reducing water usage corresponds to BHA’s motto ‘Win guests, save money, save the future’. As a result, in 2017 the BHA reported the overall use of water by its members (1.19 m<sup>3</sup>/guest/night, a reduction of 1.5% from the 2016 level), and further reduced to 1.09 m<sup>3</sup>/guest/night by 2018. By 2019 the majority of hotels interviewed, especially in southern Bali, were aware of water scarcity challenges and agreed that they are also responsible for conserving water. Albeit far from significant, there is evidence that the tourism industry is more aware and acting accordingly. One hotel, that significantly reduced its water consumption, used Key Performance Indicators across all staff levels with incentives: saving water translated to higher salaries. While in 2010 very few small hotels were aware of Bali’s pending water crisis, over the years awareness has increased, and some are beginning to try to make changes for example by replacing the sheets and towels less frequently.

There is evidence of change in other sectors of the industry. For example, several tour operators are supporting IDEP’s Water Protection Program. The product developer of the largest ground handler, who provides holidays for 50,000 mostly Australian and European tourists per year, said that he “has been working to decrease negative impacts of tourism in Bali/Indonesia, and has been reading a lot about the Bali Water Crisis. As many of the articles mentioned Dr Cole’s name and research about water in Bali” (Bierschneider, 2016, pers. comm.) therefore he contacted her. The company had three Corporate Social Responsibility initiatives: waste management, human trafficking and child sex abuse, and animal welfare. They believed it is really important to educate tourists about water and decided to regularly donate to IDEP’s program. Following this engagement, IDEP reached out to two other destination management companies who are now also regular donors. One company helps to educate tourists by placing bumper stickers on their vehicles (Fig. 2), and sharing information on how to save water through brochures. The others expressed that they provide support by educating tourists and raising awareness with smaller hotels. They also provide support through their association: “Indonesian Destination Management Company Sustainability Collaboration.”

**Table 1**  
Research and activism goals, findings and impacts.

Year	Research/activism conducted	Research goals (G) and findings (F)	Impacts
2008	Film by WALHI/second author	G: Draw attention to water injustice in Bali.	Limited local impact but stimulated 1st and 3rd authors research.
2010	Research project: Water Equity, and Tourism. This included 39 interviews with Government agencies (11), NGOs (11), Community groups (2), Tourism industry associations (3), Villas (4), Academics (4), Hotels (2), business man/expatriate activist, developer, pekaseh (head of subak), restaurant, spa, laundry, architect, Coca-Cola, and Aqua, 110 tourists surveyed.	G: To develop an understanding of the stakeholders and barriers to more equitable use of Bali's water resources. F: 1) Mapped the stakeholders of the water -- tourism nexus. 2) Developed an understanding of the causes and consequences of water depletion and subsequent conflicts. 3) Identified the issues and needs of local NGOs working in environmental and social justice and working to strengthen the voice of civil society.	This was the foundational research, and future impacts builds on this original work. Two NGOs (IAA and IDEP Foundation) directly used the results of the research to develop campaigns. Entered national media (Widiadana, 2012)
2013	Presentation at ITB Berlin – Water Shortages: A Potential Conflict Between Tourists and Locals? (aimed at industry)	G: Awareness of Bali's potential water crisis to industry stakeholders.	Broader knowledge of water challenges in Bali. This presentation was used as evidence of need by a company that tendered for dam construction. Hotels started monitoring and reporting water usage.
2013	Participant observation and interviews with local communities and NGOs (12), government officials (14), and tourism agencies (9).	G: To map the water and land - tourism conflicts following spatial planning regulation. F: The new regulation perpetuated conflicts.	Public debates about spatial planning and exposure in local media (Metro Bali, 2013; Bali Post, 2018a, 2018b)
2015	"Is Tourism Killing Babies? Public Seminar" Tourism and the threat of a clean water crisis in Bali. Speakers: (1) First author, (2) Head of Bali's Hotel and Restaurant Association (3) Director of the water supply company (PDAM)	G: Increase public awareness and provoke reaction on the pending water crisis in Bali, particularly with respect to those most vulnerable.	Headlines in seven local and national newspapers (Bali Post, 2015; Fajar Bali, 2015; Jaya, 2015; Kusniarti, 2015; Nusa Bali, 2015; Parwata, 2016; Radar Bali, 2015; Suriyani, 2015) and two NGOs explicitly stated they would begin public education programs as an outcome of the seminar.
2017	A multi-stakeholder workshop and exhibition: "Paradise in Crisis: Water Scarcity versus Socio-environmental Stability." 40 attendees from government, the local water utility, academics and NGOs.  Follow-up research was conducted 9 interviews: academic (1), hotel managers (3), tour operator (1), a restaurant (1), and NGOs (2)	G: 1: To discuss the water crisis from multiple perspectives. 2: Opportunities for strengthening networks and partnerships to protect Bali's freshwater. F: What each stakeholder had done, hadn't done and what they plan to do/their priorities for action. G: Identifying tourism establishments that incorporated practices to conserve water, and initiatives to raise aware for tourists.	New collective awareness about the lack of groundwater data and its withdrawal. Awareness that utility water costs more than groundwater pumping. Plans emerged to develop a Water Resource Management Board (Dewan Air).  Other NGOs started using the research in their campaigns and began to raise their profile for water-conservation related work, including: WALHI, Manikaya Kauci Foundation, Conservation International, and Komunitas Air Langit Bali. Recommendations to raise awareness of water conservation to younger generations (on social media).
2018	Interviews conducted with small-medium hotels/accommodation (30), and government officials (5)	G: To understand water use and conservation by small and medium accommodation. To identify if the narratives and actions by government had changed. F: Awareness of water problems, and responsibility of all stakeholders but didn't conserve water because of financial and technical issues. F: Government aware but deny crisis.	Small and medium hotels made aware of simple conservation methods and increased willingness to share water with community.
2019	Follow up research conducted including 3 FGDs with hotels, homestays, and tour operators, as well as 14 interviews with government agencies (9), consultant (1), NGOs (2) and academics (2)	G: Understanding what has changed in 10 years and share the ITP report to stimulate discussion. F: More awareness of water crisis Word "crisis" now commonly discussed in reference to water. Government using "crisis" on education posters. No awareness of ITP report Use of unregistered wells continues – fines negligible. Understanding of conservation methods still	Government educational posters produced. More media coverage (Harapan Rakyat, 2019) Sustained interest.

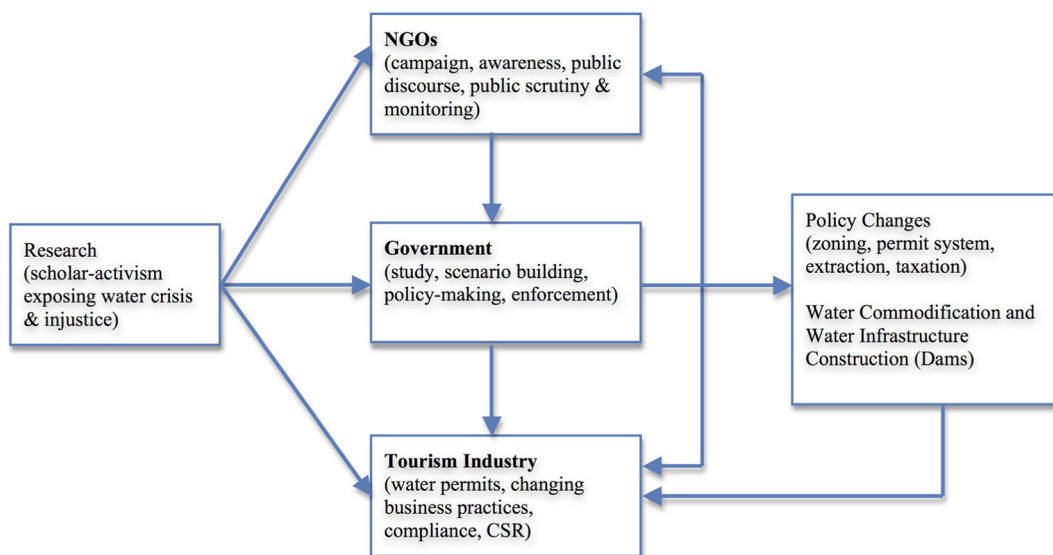
Table 1 (continued)

Year	Research/activism conducted	Research goals (G) and findings (F)	Impacts
		limited. (Perceived) costs of conservation beyond many small establishments.	

Likewise, the Head of Responsible Tourism, at a large travel agency, that sends 150,000 clients to Bali per year, said that “after reading Dr Cole’s paper they have decided that they should be getting involved to raise awareness of the water crisis happening in Bali” (Vardenega, 2017, pers. comm.). They shared information about the global water crisis via their social media outlets and on their public website, via a blog, and also in one of their brochures.

Impact on policy

While there is no direct evidence the research led to changes at the policy level, some positive moves have been made that are supported by the research. Several prominent people have explained that external criticism has been a strong motivator and that



Academic-Activists Network Diagram

Fig. 1. Academic-activists network diagram.



Fig. 2. Mobile campaign.  
Source: Buffalo Tours.

the government has responded because the first author was a foreigner. As public discourse has changed, there have been changes in policy, however some of these have had unintended consequences.

Highly complex water governance remains an issue in Bali. Surface and groundwater are subject to different state institutions located at different tiers of government. Bali's regulations are at odds with national legislation that does not specify tourism as a water user priority. Tourism is considered as commercial water use and designated as least priority. However, in Bali, since 2016 tourism is identified as a priority user of groundwater. This difference between the provincial and national regulation points to the importance of tourism to the island and the power of the industry to shape legislation. As both river basins and groundwater often cross district administrative borders, managing water at the district level is problematic, as highlighted in the original research. In Bali, there are nine water companies owned by respective district governments, known as PDAM, that supply water for consumers, including households and industries. Their sources of water are groundwater (28%), springs (32%), and surface water such as rivers and estuaries (40%) (Bappeda Bali, 2009). In Badung, the centre for tourism industry, PDAM serves 72% of water consumers, 15% of which is derived from 30 deep groundwater wells. Our research found hotels are heavily dependent on groundwater and some have up to five wells, whereas only two hotels solely use PDAM. Hence, groundwater remains an important source of water for hotels, either directly or via PDAM supplies.

#### *Groundwater zoning*

In 2014, the Provincial Bureau of Public Works conducted a study examining the state of groundwater to produce a groundwater zoning map and management plan. This was an updated version of a study conducted in 2005 by the Japanese International Cooperation Agency. The findings should support the "directed integrated, efficient and effective groundwater management to support development sectors while still taking conservation and preservation of the environment into consideration" (Dinas PU, 2014). Eight aquifers were identified, the largest of which the Denpasar-Tabanan aquifer, traverses seven districts. The decision to conduct the 2014 study demonstrates increased awareness of water challenges in Bali. The study identified an increase in the vulnerable zones locations. In 2005, the only vulnerable zone was located in a small part of North Badung. By 2014, all of North Badung is in the Vulnerable Zone, while most of Bali's south coast, the centre of the tourism industry, is considered to be in "Most Vulnerable Zones". The changes show a considerable expansion of the "Most Vulnerable and Vulnerable zones" in just nine years.

#### *Increased monitoring of groundwater use*

One of the challenges to managing groundwater was that nobody knew how much groundwater is being withdrawn. Very few respondents who used groundwater in 2010 metered it, or if they did, only one among a number of wells. Reducing the electricity bill was the main incentive to reduce groundwater use. Those with wells are now encouraged to register them and registered wells are now metered. In 2019 a number of sources said the registering of wells was being taken more seriously and all the star-rated hotels using groundwater claimed that (one, some, or all) their wells were registered and have water meters. However, many of the smaller non-star premises had unregistered wells and did not measure their water use. Furthermore, as we will argue below the registration and metering of wells may have little to do with protecting Bali's groundwater.

The Provincial Bureau of Mining grants groundwater permits, which lasts for three years and can be extended. When extending the permit, the volume of groundwater discharged in the Most Vulnerable and Vulnerable Zones must be reduced by 10% from the volume previously permitted. However, in practice, the provincial government grants a permit to whoever applies. According to the bureau, applications are never rejected, with the rationale they are trying to encourage well registration and metering to facilitate monitoring.

Tax is paid on water extracted from registered wells. However, between the permits and the tax there is a governance gap. The provincial government issues the permits and district governments collect the tax. In Badung the basic price of piped water for tourism is more expensive than the basic price of groundwater, as shown in Table 2. Consequently, it is more attractive and efficient for the tourism industry to use groundwater.

To boost tax revenues from groundwater utilisation, the Badung District Government increases the numbers of taxpayers by encouraging tourism operators to register their wells or by conducting inspections for unregistered wells. The government even provides 10% incentives for village heads that report unregistered wells for commercial purposes (Bali Post, 2018a, 2018b). This has led to an increase in groundwater taxpayers and revenue as shown in Table 3.

The Badung district is the most conscientious in monitoring groundwater use. However, the division of authorities between granting permits and extracting taxes has created a groundwater governance loophole. Increasing groundwater tax revenues, appears to be of higher interest, than conservation. Furthermore, the use of groundwater remains difficult to monitor, with some hotels only legally registering one well while using more than one. In fact, the probability and risk of being caught having illegal wells is low as inspection is technically and administratively difficult and the criminal sanctions are very lenient according to both the government and businesses. Finally, the government is reluctant to enforce any fines because they do not want people to hide their wells but to encourage well registration.

#### **Limits on impact/to the changes**

There is clear evidence that the research has increased awareness of Bali's water situation. This has led to changes among NGO's, the tourism industry and perhaps government. In this section, we consider why the actions have been limited and slow, and discuss the barriers that have inhibited a speedier and more salient response.

**Table 2**

The comparison of basic water price in Badung.(Source: District Head of Badung Regulation No. 16/2011 &amp; Governor of Bali Regulation No. 33/2017.)

No	Types of business	Surface water (USD/M3)	Groundwater (USD/M3)
1	Small hotels/homestay	0.77	0.53
2	1, 2, & 3 starred hotels	0.96	0.57
3	4 & 5 starred hotels	1.15	0.64
4	Golf courses	0.38	0.57

### NGOs – funding and competing demands

NGOs, including those in Bali, regularly face competing demands and funding challenges. IDEP made a strategic decision to secure a significant proportion of their funding before they embarked on the Water Protection Program. IAA's funding model has more flexibility in devising programs to annual budgets. Both NGOs' programs have been affected by other demands during the last 10 years including the Benoa bay land reclamation project and the eruptions, threatened eruptions and evacuations from Mount Agung.

### Tourism industry fear and power

While there is evidence of improved industry knowledge both inside and outside Bali, we need to ask why, given the seriousness of the situation, so little change has taken place. Research in 2015, showed improved rates of knowledge among small sized hotels but very few had acted on the knowledge and made changes. The 2018 interviews revealed, this was down to a lack of capital to invest in water saving technologies and there are no programs/incentives for small-scale accommodation to change. A few had engaged with the use of biopori but this was mainly for flood prevention rather than water conservation. Little had changed by 2019, when we were told that management wasn't interested, were located remotely, or didn't have the capital to invest and margins were not sufficient to cover the perceived costs of changes.

The board members for the environment of the Bali Hotel Association (BHA), which represents the biggest 150 hotels in Bali, have succeeded in persuading more hotels to measure their water use, but very little has been done to reduce it. It seems when the financial incentives do not exist, there is little incentive to change. As we have suggested, groundwater is the cheapest form of water if you register your wells and sanctions are minimal if you do not. While many are members of the International Tourism Partnership (ITP), the message of stewardship has fallen on deaf ears. Despite the publication of their Destination Water Risk Index and Bali being highlighted as the world's (equal) first for water risk in August 2018, no one in Bali was aware of the report by June 2019. Although the ITP asked the hotel head offices to invite participants to a seminar about the report – none did. The workshops were held (with attendees receiving invites via the research teams network), but none of the participants had heard of the report. Indeed, there is a significant concern among the hotel industry that information about the critical water levels could create worry among business and investments. An environmental consultant suggested, "The government actively prevents the dissemination of alarming information", while IDEP suggested "the mainstream media will not cover environmental problems for fear it will affect tourism numbers and make power-holders angry".

While tour operators, destination management companies and carriers are not direct water users, their clients, tourists, are. They have the power to influence tourists' behaviour. The biggest carrier, while initially showing enthusiasm to engage, fell short of specifically mentioning Bali in their section on responsible water use, they "didn't want to put tourists off going to Bali". They also declined to include a reminder about careful water use to tourists in pre-departure information. They didn't "want to worry tourists".

While on the one hand the industry would seem scared to act, on the other, they appear all powerful. Not only is tourism singled out as a priority industry for groundwater resources, even in the prone zones, hotels still extract water with impunity. For example, the Head of Bali's Bureau of Mining stated:

"If we apply the rules strictly in Kuta, groundwater should not be used by hotels. This is because groundwater in the waterfront areas has been contaminated by saltwater intrusion...In fact, hotels in Kuta have been granted an [hotel] operational permit because if they do not have enough water for their guests, there will be an issue and this creates a bad image for Bali's tourism."

**Table 3**Revenues from groundwater tax in Badung.(Adapted from Disnaker & ESDM Bali 2009; [www.badungkab.go.id](http://www.badungkab.go.id).)

Year	Numbers of taxpayer	Tax revenues (USD)
2016	1490	4,224,594
2017	1848	4,375,960
2018	2084	4,494,089
2019 (June)	2224	2,301,900

Note: 1 USD = IDR 4130.31.

In 2019 when asked why new permits had been granted in the prone zone he explained “*investasi orang harus jalan*” (investments must keep going). This clearly points to the power of tourism overriding water conservation management.

#### *Government – multi-tiers and lack of enforcement remain*

The original research identified overlapping mandates, sector centrism, multi-tiered governance, and weak enforcement of regulations as causes of Bali's pending water crisis. While there has been a move for under groundwater to be controlled at the provincial level there are still two gaps in the ways in which groundwater is managed and taxed. Firstly, the spatial divisions between the permits, and tax, and secondly, between the discharge and recharge of groundwater.

As discussed, there is a governance gap between province granting groundwater abstraction permits and districts collecting groundwater taxes, thus instead of using the groundwater tax as an instrument to discourage hotels using groundwater, the tax is seen as a source of regional revenue. In addition, there is an issue of discharge and recharge. For Badung, where the use of groundwater for tourism is predominantly situated, the groundwater is from the Denpasar-Tabanan aquifer but its recharge areas are situated in the neighbouring districts of Tabanan, Gianyar or Bangli. These districts are responsible for protecting and preserving the water recharge areas but receive nothing from the tax paid to Badung.

#### **Is it a “water crisis” and what next for Bali?**

In her original research Cole (2012) referred to a pending crisis. The paper was overtly political and as Lees (2001) suggests a narrative of crisis is necessarily political as it implicates a power relationship through which the crisis is produced. The response frequently takes two forms: Firstly, the construction of a counter narrative partly as a denial to the crisis so that status quo social power remains and business operates as usual. Secondly, if the crisis is difficult to deny through narratives, the social power may embrace it as a new opportunity for expansion. In relation to the water crisis, the response is taking the form of the construction of dams as a socio-technical system through which the flow of water can be directed to follow the flow of capital investment (Swyngedouw, 2009). Hence, in the next subsection we examine competing narratives on the water crisis in Bali as well as “the solution” that serves the dominant interests of the tourism industry.

#### *Competing narratives*

Following Cole's (2012) publication, discourse on water in Bali has been developed between two competing narratives, the crisis narrative and the crisis counter-narrative. In Europe the word crisis appears in titles of industry media reports (Taylor, 2013) following the presentation of the work at ITB Berlin – an avenue of action to have the findings better known to industry. The crisis narrative in Bali has been used by the NGOs and then echoed by mass media, particularly following the seminar in 2015 “Is tourism killing babies?” Eight years after the original research the ITP's Destination Water Risk Index Report (ITP, 2018: 5) put Bali, at ‘extremely high risk’ of current and future water stress.

However, the crisis narrative has been countered by a sense of optimism from government officials and the business community. Although they accept there is some concern about the conditions of Bali's water, it is not yet to be considered a crisis (*‘krisis’*) or even ‘critical’ (*‘kritis’*) but rather ‘prone’ (*‘rawan’*). Although in June 2018 the mining department, claimed that “the groundwater in Bali is still in a good condition both in terms of quantity and quality,” by 2019 the same department was producing posters using the word crisis (Fig. 3).

A counter-narrative also comes from Balinese academics. Putra (2017), a professor at Udayana University, deconstructed the narrative of the water crisis through Balinese traditional folklore. Although he accepts the authors have stimulated public debate and agrees with Cole (2012) that water issues in Bali are a matter of mismanagement, he suggests that so far, studies stating Bali is facing a water crisis are not supported by sufficient data and adequate projection and thus concludes it is unclear whether the crisis is a fact or a myth (Putra, 2017: 6). He appears to be involved in manufacturing uncertainty, perhaps to prevent panic in the markets, that leads to public doubt. It is not true that there is no data to support the conclusion of Bali's water crisis. The technical document for drafting the spatial planning regulation for Bali clearly states that the projected water-use in Bali in 2025, shows a water deficit (Bappeda Bali, 2009: III-124). This is affirmed by Sunarta (2015) who concludes that tourism expansion in North Kuta, Badung, has negatively impacted the quality and quantity of water leading to water deficit for local use. Moreover, mass media frequently report how local communities in South Bali struggle to meet their basic water needs (see Miasa, 2018; Suryani, 2014; Suyatra, 2019).

#### *Dam construction*

In another department, the Head of Dams Division of River Basin Organisation, stated that “there is a concern that in 5–10 years to come Bali will face a clean water crisis. One of the efforts that can be done to address such clean water crisis is through constructing dams” ([www.sda.pu.go.id](http://www.sda.pu.go.id)). Here, a narrative of crisis is required to justify the interests of constructing dams on the island. The Chief Executive Officer (CEO) of one of the companies tendering for the dam construction used Cole's research as part of the justification stating she was the “first person who flagged the issues and has got the ball rolling and was noticed by the stakeholders”. The head of the River Basin Organisation, justifies that “we try to provide surface water [through dams development] in order to reduce the use of groundwater. This is especially for hotels that use groundwater”



# AIR TANAH (GROUND WATER)

**PEMERINTAH PROVINSI BALI  
DINAS TENAGA KERJA DAN  
ENERGI SUMBER DAYA MINERAL**  
Jl. Raya Puputan - Nih Mandala Ronan. Telp. 2223963-223064 Denpasar

## Siklus Air Di Bumi

**CAT PROVINSI BALI**  
Pengelolaan Air Tanah berbasis Cekungan Air Tanah (CAT), tidak berdasarkan batas wilayah Provinsi/ Kabupaten/Kota

Air tanah adalah air yang terdapat dalam lapisan tanah atau batuan di bawah permukaan tanah. Air tanah merupakan salah satu sumberdaya air selain Air Permukaan (air sungai, Air Danau, Air Rawa, dan Mata Air). Terbentuknya air tanah membutuhkan waktu yang relatif panjang, tahunan, puluhan tahun, bahkan ratusan/ribuan tahun

Sebagian besar Industri pariwisata dan Industri lainnya, termasuk PDAM melakukan pengambilan dan pemanfaatan air tanah, melalui sumur bor ataupun sumur gali, dengan cara menyadap air tanah pada aquifer di kedalaman tertentu.

**CAT PROVINSI BALI**  
Pengelolaan Air Tanah berbasis Cekungan Air Tanah (CAT), tidak berdasarkan batas wilayah Provinsi/ Kabupaten/Kota

**CONTOH GAMBAR SUMUR RESAPAN BANGKAL BERBENTUK BULAT DENGAN MENGGUNAKAN TALANG BANGUNAN**

**LUBANG BIOFORI**

US & SDA 2%

**AIR LAUT 97%**

**AIR TANAH 1%**

**MENGAPA HEMAT AIR**  
HANYA 1% AIR TAWAR DI DUNIA

**Ayo Kita Hemat Air, Untuk Hidup Lebih Baik**

1. Manfaatkan air secara optimal, cegah kebocoran, dan jangan biarkan kran air terbuka terus-menerus
2. Basil gosok gigi, cuci muka atau memanduk. Kran wastafel jangan dibebaskan. Mengurangi 1 menit kran mengalir, 9 liter air bisa berkurang.
3. Lemah baik memanduk mandi memakai ember dan lap. Mengurangi sekitar 1/4 jam mandi, beres-ataun liter air terbuang.
4. Mandi berkompang atau mandi keruk. Sekali 15 kali lebih lama air dibanding dengan showering. Lebih cepat beres, pakai sasi 2 liter. Lebih hemat air & menghemat energi.
5. Lebih hemat menggunakan Mesin cuci piring pakailah bila yang dicuci banyak.
6. Mandi berhemat. Mandi dengan gayung paling boros air. Bila 3 kali lebih lama dibandingkan pancuran. Bisa dihemat mandi dengan pakuhan & sasi berendam.
7. Air limbah yang tidak terlalu kotor masih dapat dipakai untuk mencuci air tangan & memandikan diri.
8. Ujuyakan membuat Saurat Resapan & tidak mengubatkan semua tanah dengan semen. Untuk mempertahankan air hujan agar menjadi air sumber air untuk setiap 10 liter yang.

TANPA USAHA KONSERVASI TERHADAP SUMBER DAYA AIR DAN TANPA TINDAKAN PENGHEMATAN PENGGUNAAN AIR ... MAKA KITA PASTI AKAN KRISIS AIR BERSIH

**WATER FOR NEXT GENERATION**

WA-Te & KUTALAD DESIGN-SOFT

Fig. 3. An educational poster produced by ESDM (which refers to crisis krisis).

(Radar Bali, 2018). According to Presidential Regulation No. 3 of 2016, there are three dam construction projects designated as national strategic projects.

Observing the geography of the dam projects, it is clear that the use of groundwater for hotels in the dam locations is insignificant so it will mean transferring water from the dams to the tourism sites in South Bali. Hence, the water will flow to the area where the tourism industry grows. It seems that the water crisis, caused in a large part by excessive use of water by hotels, has been used to justify water infrastructure projects through which further expansion of tourism will be facilitated. The impact of the dams on local agriculture is beyond the scope of this paper but the CEO of the water company who sought Cole's support, admitted that if demand was not curbed, the first dams supply would be insufficient by the time the dam construction was finished, and without reducing demand the projects would be constantly playing catch up.

### **Achieving impact: lessons learned**

Despite the clear limitations that the research could have on achieving real change in Bali, it is useful to reflect on HOW the research achieved the impacts it did, and on the lessons learned about creating impact. These include: purpose and scholar reflectivity, mobilizing media; partners, industry engagement and linking them, and time and repetition. These are documented through Table 1 and represented graphically in Fig. 4.

#### *Purpose and scholar reflectivity*

All the authors have played 3 of the 4 roles of academic activism discussed by Blomley (2008) including the production of knowledge that challenges the dominant tourism discourse in Bali through writing and teaching. Through becoming scholars with a voice in the public sphere and by facilitating change and as members of lobby groups seeking to create change (Hales et al., 2018). Action research has been at the heart of our work (Cole, 2004; Cole, 2005; Wardana, 2018). The research was academic but the purpose was to bring about greater water justice. We conducted our research in spirit of what Borrás (2016: 1) called "scholar-activism", namely "rigorous academic work [...] which is explicitly and unapologetically connected to political projects".

A scholar's position will affect how impactful their research is. Accepting our subjectivity (Peshkin, 1988) and allowing our empathy and concern to shape our work, can provide the passion and purpose necessary to be agents of transformation (Sigl, 2019). If scholars do not separate themselves and "avoid the tendency to become 'absent' from, or 'above' our research" (Bott, 2010), but take an active part in the study context, their research is more likely to generate impact.

#### *Mobilizing media*

The researchers used mechanisms that echo those suggested by Cherney et al. (2015), in addition to developing informal personal contacts, we held seminars, symposium and multi-stakeholder workshops and transmitted the research through many media channels, including combining with arts and popular culture. Cole held the "Is tourism killing babies?" seminar to deliberately provoke and get the pending crisis in the media.

Similarly, the one-day multi-stakeholder meeting organised to bring the stakeholders together to debate the issues, was foregrounded by a press event to gain newspaper coverage. Cole's foreignness has made it easier. As discussed above, the belief that foreigners know best is common in Bali, and appears to be true in foreign media as well. For example, in 2019, Cole was interviewed by Al Jazeera, which led to a number of newspaper articles (Daud, 2019; Halim, 2019; Morris, 2019; Nuebauer, 2019). Wardana was not contacted, despite his publications and interview in their original film. The foreign voice was given precedence over locals.

Outside Bali, the media was engaged to report the issue via radio, foreign newspapers, and industry press. We aimed this external media at the industry and in particular hotels. We used internal media to nudge local opinion, the government and local industry stakeholders. We recognised that not everyone consumes news through newspapers and hence made use of dance (highbrow/traditional older audience) vox pop (younger audience) and film.

Tourism is all-over mass and social media but could be used more by scholars for impact creation. To maximise the impact of our research we have to identify our target audiences and identify the appropriate media forms that would best engage with them. As most tourism and social scientist scholars are not media specialist, we suggest this is best done in partnership with those that are, to translate and amplify messages in the most appropriate way.

#### *Partners, industry engagement and linking them*

The impact achievements have all involved partners, as Khazragui and Hudson (2014) suggest, "all research needs the involvement of others to convert it into impact". In this case the relationships have been developed over a long period of time, as Ward et al. (2017) suggest personal contact and developing trust through periodic support and continuity of contact is essential for proactive engagement and impactful research. As researchers, we have provided the evidence base and together with the NGOs, the forums for debate, as well as hooks to get media buy in, and created public debate. While working with NGOs it was necessary to both foster ongoing contact, not only with the multiple field trips but also between trips via email. The NGOs turned the research into film, theatre, vox pop and other media to raise awareness in the Balinese population. Part of the work of the researchers was

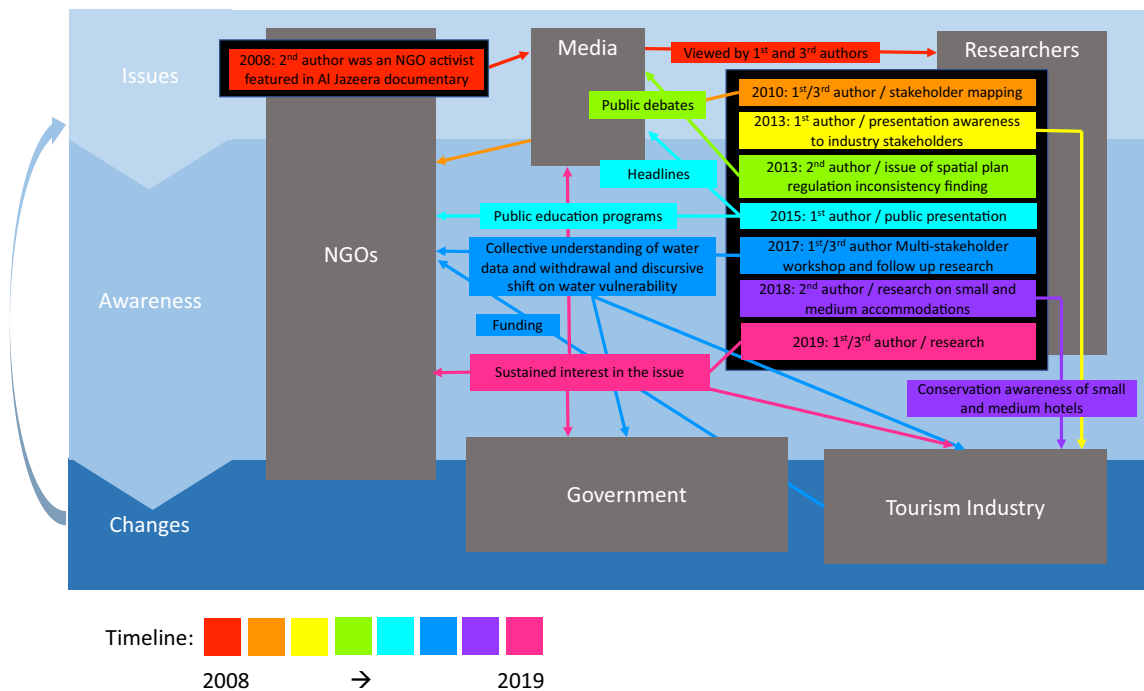


Fig. 4. Creating impact over time.

to link the NGOs so their work was complimentary rather than competitive, and link the NGOs with other stakeholders – for example, the introduction of the water park owner and tour operator to IDEP, which together with other Destination Management Companies ensured the necessary funding for the Bali Water Protection Program to start. Not all linking has been so successful, for example, ITP offered to pass workshop invites to their members' hotels but their engagement with their members is unclear, as none of the hotels received the invitations, or had heard about Bali featuring in the ITP water risk report (which their head offices had commissioned).

For tourism research to be impactful, industry engagement is necessary, although many consider this knowledge transfer to be inefficient and ineffective (Hardy et al., 2018). This maybe because informal collaborations are under-researched and the diffuse nature of the relationships. We suggest providing learning opportunities for industry, engaging them as partners to create a mutual dialogue of learning, and creating links between them will increase opportunities for research to be impactful.

#### Time and repetition

As Font et al. (2019) suggest there is a time lag between research and impact in the social sciences, but it is also the case that one off research is far less likely to be impactful. As Hoarau and Kline (2014) suggest in relation to business innovation “long-term interaction, sharing tacit knowledge and building social capital between scientists and tourism businesses facilitates the absorption of research-based knowledge,” (45). We believe the long-term nature of the research and activism facilitated our impact. By being in the field numerous times over a ten-year period has allowed the building and sustaining of productive relationships, which would have been impossible in a one-off research project. These enduring relationships are in themselves a form of subtle impact (Armstrong & Alsop, 2010).

#### Limitations

This paper has not discussed our engagement with tourists themselves, who might be a direct route to reduce water overconsumption in Bali. The original research did survey over a hundred tourists but over 90% were unaware of Bali's water situation. We are aware that tourists as the consumer may have power to impact destinations. Indeed, boycotts have been used to demand change in unethical practices albeit with different degrees of success (Castaneda & Burtner, 2010; Shaheer et al., 2019). However, in the context of Bali's water crisis we do not believe it would be effective, as tourists are unaware of the problem, and, as we have argued, the problem lies in the water governance system. In the surveys tourists also outwardly expressed a willingness to pay an extra tax for environmental issues but their concern related to the accountability of such a tax. Furthermore, Cetin et al. (2017) suggest that willingness to pay is related to personal experience, but it is difficult for tourists to relate to water scarcity if they continue to see experience luxurious water abundance. For these reasons and given the volume and diversity of the tourists we chose to target them through intermediaries – tour operators and hotels, the challenges of which we have discussed.

## Conclusion

This paper has answered a call (Font et al., 2019) to report on the impact created by previous publications. We set out to show how and why a series of committed social science researchers were able to have an impact on Bali's tourism-water nexus and to highlight some of the challenges. By setting out to create public dialogue, we were able to prod the attention of the government, tourism industry, and several key NGOs. Thus, our impact was conceptual, we alerted policy makers and practitioners about Bali's water crisis. As Meagher et al. (2008) suggest conceptual impact is more about consciousness raising and making an impact on the knowledge, understanding and attitudes of policy-makers and practitioners. This form of impact may be less demonstrable and recognised than instrumental impact, but is equally important. While Thomas (2018) suggests a lack of dedicated funding opportunities inhibits the development of impactful research, the original research was conducted on a shoestring budget (£4K). Despite the minimal budget, we brought voice to Bali's pending water crisis and helped it gain attention.

Even the idea of calling the situation a crisis by the NGOs, or a Prone Zone by the government, shows that the dialogue that we initiated impacted them, and they reacted to it. NGOs created programs, while the tourism industry, increasingly seen as the culprit, has tried denial and "greenwash" to hide. Meanwhile the government, concerned that water shortages could jeopardize the main economic driver of the island, have used the water crisis as an opportunity to justify new dam construction projects. In this way, our research had an impact on public dialogue, but has fallen short at creating fundamental and meaningful change on how water policies are decided or the more equitable distribution of water.

We identified some critical elements of impactful tourism research: purpose, our long-term repetitive research, mobilizing media, partnerships and linking them. Despite these combined factors giving us credibility and trust, we have had limited success in changing the tourism industry. While larger hotels are reducing their water use per room, overall water use is still increasing. Meanwhile, over-supply and suppressed room rates means smaller hotels lack the capital or awareness to make changes. Some local tour operators contribute to the work on NGOs and spread awareness to tourists. However, bigger intermediaries are afraid of scaring off business and the potential negative affect this could have on their financial bottom line. We have not indented the business as usual model because as Scheyvens et al. (2016) suggests that "there is a clash between the dominant business model, which is based upon short-term planning with a narrow focus on finances, and a longer-term sustainable development agenda (378)."

There is a common view that the mismanagement of water has been precipitated by the decentralisation policy in 1998, when Bali was divided into nine districts, each with the authority to manage resources within their territories. These districts have seen water taxation as part of this revenue generation, hotels are incentivised to draw on groundwater, and monitoring its use is about tax revenue not conservation. Academics, politicians, NGOs and policy makers have attempted to push for a 'one island one management' approach (Wardana, 2019). They believe Bali, a small island province with limited resources including water, should be governed at the provincial level. However, this proposal can only be implemented when every district agrees to submit their tourism management authority to the provincial government. In the current political conditions of Bali, this transition to a one island approach, is still some way off.

The rapid and continued expansion of the tourism industry has resulted in fundamental change taking place across Bali. As Vickers (2015:370) has said, "the ecology underpinning all aspects of Balinese life is now under terrible threat... Bali is facing massive overdevelopment." Water and the water crisis shows the challenges of the continued growth trajectory and the threatened carrying capacity of one of its most important resources. This reflection on nearly a decade activist action research on the water crisis on a patchwork of minimal budgets suggests sooner, rather than later, Bali will confront new water challenges.

Activist academia takes time, this paper has reported on the first ten years of work that has highlighted a problem, increased public awareness, supported NGO advocacy, changed local discourse and nudged policy change. Although it is challenging to measure the impact of social science research, at the very least, it can support NGOs that often lack the resources to conduct rigorous research and need empirical evidence to support their advocacy. They in turn will push for change and over-time our findings can create impact.

## Statement of contribution

The contribution to knowledge, theory, policy or practice offered by the paper

The contribution to knowledge comes from the unfolding story of Bali's water crisis and how the narrative of crisis is being used to justify new development projects to support more business-as-usual tourism, over sustainability. The paper also contributes to policy through its explorations of the governance gap in water regulation on the island and offers solutions. The praxis offered in the paper comes from the lessons learned from academic activism and the exploration of how we engaged the media to raise awareness, how we worked with local NGOs and international bodies, as well as the tourism industry, in our attempts to limit Bali's water crisis.

How does the paper offer a social science perspective/approach

The paper is based in qualitative political ecology research over a period of ten years, using interviews, focus groups and multi-stakeholder meetings. It answers a recent call for tourism scholars to report on the impact of their publications and interventions, a gap in the social science literature more generally. A detailed analysis of the methods and actions is used to unpick the factors that enhanced knowledge exchange and uptake. Furthermore, the paper reflects on the lessons learned from activist scholarship and

the reasons why the research was impactful as well as the limitations to that impact. We identify, even on a small budget research can be impactful if it is dedicated, long-term, involves partnerships of trust and researchers are credible.

## Declaration of competing interest

None.

## References

- Antara, M., & Sumarniasih, M. S. (2017). Role of tourism in economy of Bali and Indonesia. *Journal of Tourism and Hospitality Management*, 5(2), 34–44.
- Armstrong, F., & Alsop, A. (2010). Debate: Co-production can contribute to research impact in the social sciences. *Public Money & Management*, 30(4), 208–210. <https://doi.org/10.1080/09540962.2010.492178>.
- Badan Pusat Statistik (BPS) Bali (2012). *Tingkat Hunian Kamar Akomodasi di Provinsi Bali 2011*. Denpasar: BPS Bali.
- Badan Pusat Statistik (BPS) Bali (2019). *Bali In Figure 2019*. Denpasar: BPS Bali.
- Bali Post 2015 Pertumbuhan Kamar Hotel Picu Krisis air Bersih 15 April 2015.
- Bali Post (2018, October 19a). Sungai di Bali Kategori Krisis Air. Retrieved from [https://issuu.com/epaper-kmb/docs/bpo\\_19102018](https://issuu.com/epaper-kmb/docs/bpo_19102018) (Accessed 18 June 2020).
- Bali Post (2018b). Bali dan Bom Waktu Krisis Air Bersih. Retrieved from <https://www.balipost.com/news/2018/12/11/63457/Bali-dan-Bom-Waktu-Krisis...html> (Accessed 18 June 2020).
- Bappeda Bali (2009). *Materi Teknis Rencana Tata Ruang Wilayah Provinsi Bali (2009–2029)*. Denpasar: Bappeda Bali III, 124.
- Bastow, S., Dunleavy, P., & Tinkler, J. (2014). *The impact of the social sciences: How academics and their research make a difference*. London, England: Sage.
- Blomley, N. (2008). The space in critical geography. *Progress in Human Geography*, 32(2), 285–293.
- Bornmann, L. (2012). Measuring the societal impact of research. *EMBO Reports*, 13(8), 673–676.
- Borras, S. M. (2016, April 14). *Land politics, agrarian movements and scholar-activism*. International Institute of Social Studies: Inaugural lecture. The Hague.
- Bott, E. (2010). Favourites and others: Reflexivity and the shaping of subjectivities and data in qualitative research. *Qualitative Research*, 10(2), 159–173.
- Buffalo Tours (2020). <https://www.buffalotours.com/balis-fresh-water-crisis>.
- Castaneda, Q., & Burtner, J. (2010). Tourism as "a force for world peace": The politics of tourism, tourism as governmentality and the tourism boycott of Guatemala. *The Journal of Tourism and Peace Research*, 1(2), 1–21.
- Cetin, G., Alrawadieh, Z., Dincer, M. Z., Istanbulu Dincer, F., & Loannides, D. (2017). Willingness to pay for tourist tax in destination: Empirical. Evidence from Istanbul. *Economics*, 5(2), 21.
- Cherney, A., Head, B., Povey, J., Ferguson, M., & Boreham, P. (2015). Use of academic social research by public officials: Exploring preferences and constraints that impact on research use. *Evidence & Policy: A Journal of Research, Debate and Practice*, 11(2), 169–188.
- Cole, S. (2004). Shared benefits: Longitudinal research in Eastern Indonesia. In *Qualitative research in tourism*. Routledge, 310–324.
- Cole, S. (2005). Action anthropology: Methodological innovations in tourism research. *Tourism Recreation Research*, 30(2), 65–72.
- Cole, S. (2012). A political ecology of water equity and tourism: A case study from Bali. *Annals of Tourism Research*, 39(2), 1221–1241.
- Cole, S., & Browne, M. (2015). Tourism and water inequality in Bali: A social-ecological systems analysis. *Human Ecology*, 43(3). <https://doi.org/10.1007/s10745-015-9739-z#page-1>.
- Cornell Hotel Sustainability Benchmarking (2019). Retrieved from <https://greenview.sg/chsb-index/>.
- Daud, S. (2019). Bali running out of water due to drought industry and tourist demands. Retrieved from <https://mothership.sg/2019/12/bali-no-water/>.
- Dinas Pekerjaan Umum (PU) (2014). *Pekerjaan Pembuatan Peta Zonasi Pemanfaatan Air Tanah Provinsi Bali Tahun Anggaran 2014*. Denpasar: Dinas PU.
- Eryani, I. G. A. P., & Jayantari, M. W. (2019, December). Water conservation model in Ayung river estuary based on ecotourism. *Journal of physics: Conference series. vol. 1402(3)*. IOP Publishing (033021).
- Fajar Bali (2015 April 15). Bali Selatan Boros Air: Perlu Ada Moratorium Hotel. Retrieved from <https://issuu.com/hufajarbali/docs/150415>.
- Ferguson, M. (2014). *The research impact agenda: Defining, demonstrating and defending the value of the social sciences*. Australian Review of Public Affairs.
- Field, L. (2013). Impact sometimes requires long decades of research. Retrieved from <http://www.theaustralian.com.au/higher-education/impact-sometimes-requires-long-decades-of-research/story-e6frgjcj-1226652450543?nk=45aa5b27b2900680bbe63551de476f8#> (Accessed 15 July 2014).
- Font, X., Higham, J., Miller, G., & Pourfakhimi, S. (2019). Research engagement, impact and sustainable tourism. *Journal of Sustainable Tourism*. <https://doi.org/10.1080/09669582.2019.1560673>.
- Gouda, F. (1993). The gendered rhetoric of colonialism and anti-colonialism in twentieth-century Indonesia. *Indonesia*, 55, 1–22.
- Hales, R., Dredge, D., Higgins-Desbiolles, F., & Jamal, T. (2018). Academic activism in tourism studies: Critical narratives from four researchers. *Tourism Analysis*, 23(2), 189–199.
- Halim, H. (2019). Bali running out of water thanks to massive tourist intake 260 of 400 rivers now dry. Retrieved from [World of Buzz News](https://www.worldofbuzz.com/bali-is-running-out-of-water-thanks-to-massive-tourist-intake-260-of-400-rivers-now-dry/) <https://www.worldofbuzz.com/bali-is-running-out-of-water-thanks-to-massive-tourist-intake-260-of-400-rivers-now-dry/>.
- Harapan Rakyat Online (2019, July 1). Masyarakat Bali Perlu Tingkatkan Kesadaran Hemat Air. Retrieved from <https://harapanrakyatonline.com/masyarakat-bali-perlu-tingkatkan-kesadaran-hemat-air> (Accessed 20 June 2020).
- Hardy, A., Vorobjovas-Pinta, O., & Eccleston, R. (2018). Enhancing knowledge transfer in tourism: An Elaboration Likelihood Model approach. *Journal of Hospitality and Tourism Management*, 37, 33–41.
- Hoarau, H., & Kline, C. (2014). Science and industry: Sharing knowledge for innovation. *Annals of Tourism Research*, 46, 44–61.
- District Head of Badung Regulation No. 16/2011. Retrieved from [http://jdih.badungkab.go.id/uploads/produk-hukum/peraturan/2011/PERBUP/PERBUP\\_16\\_2011.pdf](http://jdih.badungkab.go.id/uploads/produk-hukum/peraturan/2011/PERBUP/PERBUP_16_2011.pdf).
- Governor of Bali Regulation No. 33/2017. Retrieved from <https://jdih.baliprov.go.id/produk-hukum/peraturan/abstrak/24304> (Accessed 18 June 2020).
- I am an angel (2017, April 21). Water, I'm with you. Retrieved from <https://www.youtube.com/watch?v=U1nEvONc0wg>.
- IDEP (2017). Retrieved from <https://causesdrivenexposure.wordpress.com/2017/11/08/mt-agung-awakening-environmental-stress-relief/>.
- ITP (2018). ITP destination water risk index. Retrieved from <https://www.tourismpartnership.org/press-release/>.
- Jaya, G. N. (2015, November 1). Lama tak muncul, 'Petruk' curhat krisis air di Renon Denpasar. Retrieved from [Merdeka](http://www.merdeka.com/peristiwa/lama-tak-muncul-petruk-curhat-krisis-air-di-renon-denpasar.html) <http://www.merdeka.com/peristiwa/lama-tak-muncul-petruk-curhat-krisis-air-di-renon-denpasar.html>.
- Khazragui, H., & Hudson, J. (2014). Measuring the benefits of university research: Impact and the REF in the UK. *Research Evaluation*, 24(1), 51–62.
- Kusniarti, A. A. S. (2015, April 14). Cok Ace Minta Pembangunan Hotel di Bali Dihentikan Sementara. Retrieved from [Tribun News](https://bali.tribunnews.com/2015/04/14/cok-ace-minta-pembangunan-hotel-di-bali-dihentikan-sementara) <https://bali.tribunnews.com/2015/04/14/cok-ace-minta-pembangunan-hotel-di-bali-dihentikan-sementara>.
- Lees, S. H. (2001). Kicking of the Kaiko: Instability, opportunism, and crisis in ecological anthropology. In E. Messer, & M. Lambek (Eds.), *Ecology and the sacred: Engaging the anthropology of Roy A. Rappaport* (pp. 49–63). Michigan: University of Michigan Press.
- Meagher, L., Lyall, C., & Nutley, S. (2008). Flows of knowledge, expertise and influence: A method for assessing policy and practice impacts from social science research. *Research Evaluation*, 17(3), 163–173.
- Metro Bali (2013, March 21). Bali Clean dan Green: Komitmen Jadikan Bali Bersih, Sehat, Nyaman dan Indah. Retrieved from <https://metrobali.com/bali-clean-dan-green-komitmen-jadikan-bali-bersih-sehat-nyaman-dan-indah/> (Accessed 18 June 2020).
- Miasa (2018, December 8). Bali Defisit Air 2 Miliar Meter Kubik. Retrieved from [Bali Post](https://www.balipost.com/news/2018/12/08/63167/Bali-Defisit-Air-2-Miliar...html) <https://www.balipost.com/news/2018/12/08/63167/Bali-Defisit-Air-2-Miliar...html> (Accessed 27 June 2019).

- Morris, H. (2019 December 6). Bali's worsening drought is blamed on tourists using more than half its water. Retrieved from <https://www.telegraph.co.uk/travel/destinations/asia/indonesia/bali/articles/bali-drought-water-crisis/?fbclid=IwAR2dJLecx5nJGr5WJqWMuua5mQfGnr7GbPx1Uf6NwE4WVW9WzkAEjNyfcHc>.
- Muhajir, A. (2015). Pariwisata lahirkan ancaman krisis air di Bali. Retrieved from <https://www.rappler.com/world/regions/asia-pacific/indonesia/90735-pariwisata-ancam-krisis-air-bali>.
- Nuebauer, I. L. (2019, December 2). Bali: The tropical Indonesian island that is running out of water. Retrieved from Al Jazeera [https://www.aljazeera.com/news/2019/12/bali-tropical-indonesian-island-running-water-191201051219231.html?fbclid=IwAR2\\_pBw-PZY39gZkRY56H0krkAZsvzjG9KQmuVIZivYlnVaVw-RAEnw8lw](https://www.aljazeera.com/news/2019/12/bali-tropical-indonesian-island-running-water-191201051219231.html?fbclid=IwAR2_pBw-PZY39gZkRY56H0krkAZsvzjG9KQmuVIZivYlnVaVw-RAEnw8lw).
- Nusa Bali (2015). *Pariwisata dan Ancaman Krisis Air Bersih di Bali 15th April 2015*.
- Parwata (2016). Krisis Air Ancam Bali. *Bali Post*, 135, 8.
- Peshkin, A. (1988). In search of subjectivity—One's own. *Educational Researcher*, 17(7), 17–21.
- Putra, I. N. D., 2017, "Fakta atau Fiksi: Dekonstruksi Wacana Krisis Air di Bali dengan Kisah Tantri," Paper presented at Sarasehan Pesta Kesenian Bali 2017, at Gedung Ksirarnawa, Taman Budaya, Denpasar, 29 June 2017.
- Radar Bali (2015). *Pariwisata Biang Krisis Air?*, 22 (April 15th 2015).
- Radar Bali (2018, December 8). Atasi Krisis Air Bersih di Denpasar, BWS Segera Bangun Lima Bendungan. Retrieved from <https://radarwali.jawapos.com/read/2018/12/08/107545/atasi-krisis-air-bersih-di-denpasar-bws-segera-bangun-lima-bendungan>.
- REF (2018, November 28). Panel criteria and working methods. Retrieved from [https://www.ref.ac.uk/2014/media/ref/content/pub/panelcriteriaandworkingmethods/01\\_12.pdf](https://www.ref.ac.uk/2014/media/ref/content/pub/panelcriteriaandworkingmethods/01_12.pdf).
- Rimba, A. B., Chapagain, S. K., Masago, Y., Fukushi, K., & Mohan, G. (2019, July). Investigating water sustainability and land use/land cover change (LULC) as the impact of tourism activity in Bali, Indonesia. *IGARSS 2019-2019 IEEE International Geoscience and Remote Sensing Symposium* (pp. 6531–6534). IEEE.
- Rymer, L. (2011). *Measuring the impact of research—The context for metric development*. Turner, Australia: The Group of Eight.
- Scheyvens, R., Banks, G., & Hughes, E. (2016). The private sector and the SDGs: The need to move beyond 'business as usual'. *Sustainable Development*, 24(6), 371–382.
- Shaheer, I., Carr, N., & Insch, A. (2019). What are the reasons behind tourism boycotts? *Anatolia: An International Journal of Tourism and Hospitality Research*, 30(2), 294–296.
- Sigl, L. (2019). Subjectivity, governance, and changing conditions of knowledge production in the life sciences. *Subjectivity*, 12(2), 117–136.
- Sunarta, I. N. (2015). *Dampak Perkembangan Usaha Akomodasi Terhadap Sumber Daya Air di Kecamatan Kuta Utara Kabupaten Badung, Bali*. Doctoral Thesis: Universitas Udayana.
- Sunarta, I. N., & Rahman, A. (2015). *Study on the development of water crisis in Bali Island in 2009 and 2013*. E-Journal of Tourism.
- Suriyani, L. D. (2015). Bali Terancam Krisis Air, Mengapa? Retrieved from Mongabay Indonesia <https://www.mongabay.co.id/2015/04/15/bali-terancam-krisis-air-mengapa/> (Accessed 27 June 2019).
- Suriyani, L. D. (2014, October 7). Kemarau, Warga Jimbaran Kesulitan Air Bersih. Retrieved from Mongabay Indonesia <https://www.mongabay.co.id/2014/10/07/kemarau-warga-jimbaran-kesulitan-air-bersih/> (Accessed 27 June 2019).
- Suyatra, I. P. (2019, February 20). PDAM Ngadat, Warga di Badung Hampir Seminggu Tanpa Air. Retrieved from Bali Express <https://baliexpress.jawapos.com/read/2019/02/20/120398/pompa-pdam-ngadat-warga-di-badung-hampir-seminggu-tanpa-air> (Accessed 27 June 2019).
- Swyngedouw, E. (2009). The political economy and political ecology of the hydro-social cycle. *Journal of Contemporary Water Research & Education*, 142(1), 56–60.
- Taylor (2013 March 8). *Water crisis will break destinations warns academic*. Travel Weekly.
- Thomas, R. (2018). *Questioning the assessment of research impact: Illusions, myths and marginal sectors*. London, England: Palgrave Macmillan.
- Thomas, R., & Ormerod, N. (2017). The (almost) imperceptible impact of tourism research on policy and practice. *Tourism Management*, 62, 379–389.
- Vickers, A. (2015). Concluding remarks: Critical studies of tourism in Bali. In N. D. Putra, & S. Campbell (Eds.), *Recent developments in Bali tourism* (pp. 369–373). Buku Arti: Denpasar.
- Ward, S., Butler, D., Adams, R., O'Callaghan, S., Warren, N., Wickett, M., ... Uden, C. (2017). Developing university-society partnerships with a focus on climate change impact research using the "business assist" model. *Research for All*, 2(1), 163–174. <https://doi.org/10.18546/RFA.01.1.14>.
- Wardana, A. (2018). Legal engineering in a contest over space in Bali. *Australian Journal of Asian Law*, 19(1), 1–12.
- Wardana, A. (2019). *Contemporary Bali: Contested space and governance*. Singapore: Palgrave Macmillan.
- Widiadana, R. (2012). Tourism industry responsible for water crisis in Bali: Expert. <http://www.thejakartapost.com/news/2012/09/05/tourism-industry-responsible-water-crisis-bali-expert.html>.

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