



ARTICLE



<https://doi.org/10.1057/s41599-022-01140-5>

OPEN

# Addressing water scarcity in developing country contexts: a socio-cultural approach

Renu Emile<sup>1✉</sup>, John R. Clammer<sup>1</sup>, Palak Jayaswal<sup>1</sup> & Paribhasha Sharma<sup>1</sup>

Current conceptualizations of and approaches to scarcity tend to be economic-focused and institution driven with understated and underemphasized sociocultural dimensions. We address this lack in a socio-cultural orientation to natural resource scarcity and draw upon Vygotsky's theorizations to do so. We rely on the existing literature and secondary sources of information to overview issues relating to water scarcity and the survival related challenges especially in developing country contexts with a specific focus on India. Although Vygotsky theorizes individual learning and development in terms of influences from more knowledgeable individuals to the less knowledgeable, he does not engage so much with how individual learning and development is tied to community interests and community development. We extend Vygotsky by incorporating a responsabilization dimension in theorizations of individual development. Neither does Vygotsky consider how a range of communication modes including traditional or non-traditional media and technology can play an enabling role in reinforcing processes of influence. We include these to further extend Vygotsky. We consider the role of elite individuals such as community leaders and others well-recognized for their socio-cultural status or specialized skills in disseminating knowledge in Vygotsky's zones of proximal development. We emphasize the circulation of knowledge via sociocultural interactions as pertinent to raising consciousness of natural resource scarcity. We finally discuss initiatives to manage water scarcity at consumer, community and industry-consumer partnership levels. The paper broadens current understandings of scarcity and extends Vygotsky's sociocultural theorizations in the focus on communities, the responsabilization of consumers as well as in the usage of communication modes, and suggests independent and supported consumer-driven and consumer-centered initiatives as complementary to the existing in seeking solutions to water-scarcity in developing country contexts.

<sup>1</sup>O.P. Jindal Global University, Sonipat, India. ✉email: [remile@jgu.edu.in](mailto:remile@jgu.edu.in)

## Introduction

Scholarly literature examines scarcity from a range of perspectives and standpoints, such as the economic and the psychological with understated and underemphasized socio-cultural dimensions. We address this lack in a socio-cultural orientation to natural resource scarcity and turn attention to the scarcity of water. We focus on developing country contexts and specifically consider water-scarcity in India. We draw upon Vygotsky's theorizations of learning and development and rely on the existing literature, and secondary sources of information to consider the role of consumers in managing the water-scarcity challenge. We finally offer suggestions on how water-scarcity can be managed through independent and supported consumer-centered and consumer-driven initiatives and programs.

## Scarcity: an overview

This section provides a brief overview of key approaches such as the economic, the psychological, the interpretive and the resource-oriented to understanding scarcity in the literature.

The term "scarcity" is derived from "escartes", an Old Northern French word referring traditionally to a time-bound situation that has arisen from crop failures or inadequate supplies of goods necessary for life (Xenos 1989). The term is now applied to a range of issues and scarcity-kinds such as the absolute or relative, real or artificial, supply and demand of goods, consumer needs, global poverty, and environmental conservation and change. At its very basic, the term connotes increasingly expanding human needs and wants. At the same time of course, scarcity can be also understood as changes in supply with the means to addressing these gaps remaining limited.

Scarcity studies address a range of questions that draw upon diverse disciplines. Gierl and Huettl (2010), for example, draw on traditional (economics) concepts of supply and demand and consider the impact of scarcity due to supply and scarcity due to demand on consumers' attitudes toward products. Their findings point to the significant role of conspicuous consumption in consumers' attitudes and decisions, conspicuous consumption here referring to ostentatious displays of products with purposes or motives of acquiring or maintaining status or prestige (Ordabayeva and Chandon 2011; Page 1992; Veblen 1925, 1970). We note that even though economic approaches provide a demand-supply led understanding of scarcity, questions and issues relating to sociocultural needs remain largely unaddressed in such approaches.

Quite similarly, Suri et al. (2007) engage consumer psychology in studying the effects of perceptions of scarcity on how consumers process price information. Zhu and Ratner (2015) consider how scarcity impacts on choice in a product class. Salerno and Sevilla (2019) note consumers' perceptions of scarce foods as having more calories. They examine the significance of normatively irrelevant information, such as scarcity as opposed to prior research that focuses on normatively relevant information, such as fat content and serving size in calorie estimates. The higher calorie estimates provide insights into the psychology of scarcity. Scarce food is seen as valuable and expensive inducing feelings of resource deprivation and motivated perception. Monroe and Zoltners (1979) develop a product-pricing mix model to analyse pricing effects on consumer choices and decisions during periods of scarcity. In sum, while consumer psychology approaches provide insights into consumers' psychological processes, these are fundamentally individual in nature, not necessarily linked to sociocultural needs and values and community well-being. These approaches are thus limited in terms of social and community value.

A stream of research in the scarcity literature examines communications, for example, demand-framed vs. supply-framed messages and consumers' purchase intentions in online booking contexts (Huang et al. 2020). The study notes that even though scarcity related communications that highlight a product or service as scarce are ubiquitous in the travel industry, the demand-framed rather than the supply framed appeal leads to higher purchase intention amongst consumers. Aggarwal et al. (2011) examine the relative effects of limited-quantity and limited-time messages on consumers' purchase intentions and observe that limited-quantity messages are more effective than limited-time messages with enhanced differentials for symbolic brands. Even as the scarcity literature identifies the significance of communication in consumer responses, these messages apply principles of a psychological nature to motivate consumers to buy. Such communication though effective in boosting sales does not necessarily direct attention to issues and needs that may involve individuals and collectives and sociocultural aspects.

Hamilton (2020) approaches scarcity from a public policy perspective and observes changes in consumers' needs and behaviors through the COVID-19 crisis. As she notes, consumers may respond more thoughtfully and creatively to scarcity as they proceed through a crisis, and could also exhibit erosion of loyalty in substituted choices with lasting effects on behaviors. Such consumer responses, she argues, have implications for public policy. For example, in terms of direct or indirect interventions by governments to regulate pricing of essentials or of scarce items such as hand sanitizers and disinfectants through COVID-19. Or in terms of leveraging channels of communication to disseminate information such as where to find scarce items and viable substitutes through crisis situations. No doubt, public policy holds merit in addressing scarcity. However, public policy alone without sufficient involvement or commitment of key stakeholders such as consumers themselves may not necessarily be effective.

Interpretive approaches tend to examine the various responses, meanings and perspectives assigned to scarcity by different actors (Mehta 2010, Stanley 1968; Winschewski 2017). This approach views scarcity as embedded in traditions and practices of cultures and peoples, and in the accompanying meanings and interpretations. Studies typically examine the role and significance of the types and relations of power, control and access related issues and the marginalization and exclusion of certain population groups. These studies find hunger persists even when there may be enough food resources and controversial projects such as the construction of dams in certain areas may have a severe and detrimental impact in terms of transformed access to local resources, damaged livelihoods, and infringement of basic human rights (IDMC, 2017; Kiik 2020; Mishra 2019; UN Framework Team 2012), all of which conditions can create new forms of scarcity of food, water, or other resources, or exacerbate existing inequalities and lack of access.

Hamilton et al. (2019) take a comprehensive view of the scarcity literature and categorize scarcity in terms of product and resource scarcity. While product scarcity "is a real or perceived lack of goods and services available to the consumer either in the short-term (e.g., due to stock-outs) or long-term (e.g., due to legal restrictions)", resource scarcity is the "real or perceived lack of various forms of capital (i.e., financial, social, and cultural) or other production inputs (i.e., time) that the consumer invests in order to acquire and use goods and services" (p 533). A resource is anything that is quantifiable and consumable used by consumers to survive and maintain themselves. Although the authors cover a vast range of studies, we agree on how more studies on "types of resources" (p 543) or specific scarcities (for example, natural-resource scarcity) could deepen current understandings

especially in terms of how consumers engage with different scarcity kinds, and what consumer choices and decisions mean from individual, community and societal perspectives. The study discusses four stages in the consumer decision journey and considers key aspects in each—arousal and attention in information processing at the initial stage, inference differentials and the relative importance of attributes in evaluation, responses in the choice stage and finally, usage and creativity in the consumption experience. Again, the significance of these aspects could vary across product-scarcity or resource-scarcity types, highlighting the need to consider scarcity “types”.

In sum, scarcity engages scholars and practitioners from diverse backgrounds. While the literature provides a wide range of information on scarcity, we note there is relatively little from a socio-cultural perspective. We identify the need to study specific scarcity-types and how a scarcity type might shape consumers’ interactions and define their roles. Accordingly, we take a sociocultural approach to engage with natural resource scarcity, and examine the role of consumers in addressing a specific scarcity type—that of water.

### Natural resource scarcity

The World Trade Organization (WTO) defines natural resources as “stocks of materials that exist in the natural environment that are both scarce and economically useful in production or consumption, either in their raw state or after a minimal amount of processing” (World Trade Organization, 2010, p 46). Natural resources can be distinguished as renewable such as land and water and depletable or non-renewable such as minerals, oils, and metals.

The world population growth is pertinent to natural resource scarcity as overconsumption is cited as a key reason for such scarcity. According to UN estimates, human world population is expected to grow by 32% to 9.1 billion people in the year 2050. Much of this growth is likely to occur in low-income countries that are regionally important, politically fragile or both such as Kenya, Pakistan, Nigeria, and Bangladesh (Evans 2010). Such growth is accompanied by an increase in economic activity involving vast amounts of renewable and non-renewable natural resources and overutilization of the same. Crises such as air pollution, diminishing reserves, water scarcity, and climate change are all outcomes of the overutilization of resources.

**Water scarcity.** Water scarcity is a typical case of natural resource scarcity. The diminishing availability of water for human consumption owing to population growth is made worse in the depletion of groundwater sources and freshwater bodies, high amounts of domestic water consumption, increasing contamination and wastage of suitable water thus affecting the quality of life and human survival (Carrard et al. 2019; Dwivedi et al. 2018; Hasan et al. 2019; Koop et al. 2019; National Geographic Society, 2019; Tzanakakis et al. 2020). These conditions are frequently and increasingly intensified by changing patterns of precipitation occasioned by climate change at the global level and local interventions such as extensive de-forestation (Rijsberman 2006), and by inefficiencies in water use (loss during transit) and habits such as leaving pumps running unnecessarily, simply because rural electricity supplies are free at some places.

Reports suggest 4 billion people that is, nearly two-thirds of the world’s population suffers from severe water scarcity for at least a month every year, a figure that may increase to cover nearly 6 billion people by 2050, and 73% of those affected reside in Asia (UN Water 2020).

Seasonal water fluctuations aggravate water shortages for domestic and agricultural purposes even though the infrastructure for the supply of water may exist. On the other hand, the lack of infrastructure disrupts the accessibility to water resources even when there is enough water thereby impacting on production activities and population health (Hammer 2017; Mancosu et al. 2015).

In conditions of scarcity, people often do not have the choice of availing good-quality or safe water for consumption. Contaminated drinking water leads to water-borne diseases such as diarrheal diseases, cholera, typhoid, hepatitis, and poliomyelitis. Diarrheal diseases are responsible for 1.5 million deaths annually and represent 3.6% of the global disease burden. In low-income and lower-middle-income nations, unsafe water supply, poor hygiene and inadequate sanitation cause 842,000 deaths annually, including that of 361,000 children under five years of age (Prüss-Ustün et al. 2014, 2019). The problem of access to safe drinking water is more pronounced in rural areas in comparison to urban areas. A recent report released by UNICEF and WHO (2019) reveals that two billion people still lack basic sanitation, with seven out of ten of this population living in rural areas and one-third living in the Least Developed Countries.

Scarcity of water has the potential to evolve into volatile conflicts (Heijden and Stinson 2019; Petersen-Perlman et al. 2017; Schmeier et al. 2019). Degradation in water quality due to pollution, shortages arising from development and infrastructure projects, transboundary shared water resources are amongst various reasons that foster conflict over availing the maximum quantities for different sectors such as industry, domestic, and agriculture.

Some more issues and challenges specific to developing countries are discussed in the next section.

*Water-scarcity in developing countries: issues and challenges.* Issues and challenges relating to availability and access of safe water for consumption are far more complex in low-income and developing countries (Oki and Quijcho 2020; Treacy 2019). We discuss these below:

- Developing nations, for example, nations in regions of eastern and northern Africa, West Asia, central to North-Eastern Asia often do not have the financial means to invest in water-supply infrastructure and with the increasing burden on freshwater sources face water shortages with potentially catastrophic implications (Lakmeetharan et al. 2020; Oki and Quijcho 2020). We thus observe the challenge of these two distinct drivers—population increasing aggregate demand and lack of/limited infrastructure to meet demand.
- Urbanization and internal migration (Basu and Shaw 2013; Miletto et al. 2017; Oki and Quijcho 2020) are crucial factors contributing to water scarcity. As Oki and Quijcho (2020) note, urbanization in developing nations follows a typical pattern of economic development that tends to concentrate in industrialized cities, leaving behind less developed regions. As a result, water resources in urban areas get overburdened and eventually scarce in proportion to the demands of the population. Some migrate to urban areas to escape rural water scarcity and drought and to also be able to send money back home (e.g., Hassan and Tularam 2018; Miletto et al. 2017).
- The exploitation, privatization, and overconsumption of water resources is another cause for concern in developing countries (Bartels et al. 2018; Johnson et al. 2015; Winschewski 2017). Even as ground water depletion increases, some transnational corporations over-exploit

water resources and pollute the water table. In developing countries, 90% of sewage is discharged into the water untreated (Boretti and Rosa 2019; Johnson et al. 2015). Privatization of water is often seen where governments are unable to afford water purification and delivery systems. However, rather than being a solution, privatization often leads to “corruption, lack of corporate accountability, loss of local agency, weakened water quality standards” (LeSieur et al. 2018, p 6) and effectively blocks the poor from accessing water resources. In addition to low water quality standards, wastewater treatment, or rather the lack of, can be a major issue. This means that water that could potentially be re-used may not be available and has no further use except as polluted ground-water recharge.

- Other water scarcity related issues typical to developing economies include inadequate food production. The populations of such nations are unable to grow adequate quantities of food due to frequent water shortages while also lacking the purchasing power to buy food (Mancosu et al. 2015; Oki and Quioco 2020). A less noticed aspect of water access is what is sometimes called virtual water trade, where the water contained in agricultural products themselves is transferred (and consumed). Unsustainable water exports have an impoverishing effect even though developing countries earn through exports (Water Aid 2019). Exports of 1 kg of finished cotton, for example, involve the exports of 40,000 l of water virtually in manufacturing footprint. This, however, is a substantially different issue from land-grabbing or cutting off access to local water rights. The mandating of food sufficiency (and maintaining cash crops for local consumption) rather than moving to commercial agriculture, is a highly political issue, and raises questions beyond the immediate scope of this paper.
- At times, countries with the aim to attract maximum foreign direct investment relax or overlook violations of existing environmental laws, especially if the business provides tax revenues and jobs in the country. Instances of countries diverting water supplies to the industrial sector at a cost to farming communities are not uncommon (Narayanamoorthy and Venkatachalam 2018).
- Water scarcity leads to civil conflict, wars, lack of or decline in economic growth with agricultural productivity plunging developing-countries into deeper crises. LeSieur et al. (2018) explain the root-cause of unrest in Yemen in a water crisis and water-scarcity as a main reason for the destabilization and the launch of a civil war in Syria. Conflicts over transboundary water resource agreements have the potential to turn into full-fledged wars. For instance, India often threatens to cancel the IWT (Indus Water Treaty), a 60-year-old agreement between India and Pakistan over the management of the Indus River Basin rivers and tributaries with Pakistan threatening war in retaliation (Mangi et al. 2019; Qureshi 2017). Other literature speaks to transboundary water co-operation as a peace mechanism. A study in sub Saharan Africa (Detges 2016) links water scarcity and conflict at the local level with other pre-conditions such as regional differences, access, and poorly developed infrastructure. If suitably addressed, these help in coping with drought and preventing conflict. Similarly, Sultana et al. (2019) suggest policy and collective action enable transformation from natural resource conflicts (such as those in Nepal and Bangladesh) to suitable adaptive measures, innovation and cooperation thus revealing the scope for capacity building,

grassroots initiatives, and reform of local institutions to reduce conflict.

*Water-scarcity in developing countries: India as a representative exemplar.* India ranks 120 out of 122 countries in the Water Quality Index (Desai 2019; India Today Web Desk 2019; Kant 2018). Over 50% of the country’s population is affected by severe drought like conditions and 21 major cities including Delhi, Bengaluru, Chennai, and Hyderabad may reach zero groundwater levels in the immediate future adversely affecting 100 million people (NITI Aayog, 2018). By 2030, the demand for water is expected to be twice the available supply, leading to severe water scarcity for millions. Excessive groundwater pumping, wasteful and inefficient water management systems and infrastructure and deficient monsoons all contribute to growing water scarcity. In rural areas, about 82% of households do not have access to piped water supply, 75% of households are unable to avail clean drinking water and by 2030, 40% of India’s population will not have access to drinking water (Hota 2020; India Today Web Desk 2019).

India is already experiencing the making of a severe water scarcity crisis. We provide below a brief on the water-scarcity situation in three cities—Delhi, Chennai and Bengaluru—to illustrate the same.

### Delhi

India’s capital, Delhi, is considered the fastest growing metropolis in India with about 24 million people living in the national capital territory (NCT) and in its adjacent cities. Delhi’s position as an urban agglomerate has a significant impact on its access to water resources. Delhi Jal Board (DJB) is the city’s water production and supply agency. The municipal corporation and the Delhi Development Authority are also responsible for water management in Delhi. DJB relies on surface water sources mobilized from neighboring states of Haryana, Punjab, Uttar Pradesh, and Uttarakhand (Biswas and Gangwar 2020). Water demand for municipal and drinking water in Delhi is around 913 million gallons per day (MGD) with DJB supplying 835 MGD from surface and groundwater sources. Groundwater extraction covers the deficit leading to over exploitation of groundwater sources. Up to 75% of Delhi’s population residing within informal urban spaces does not have access to piped water but relies on sources such as tankers, tube-wells as well as private sources. Water inequality across the different regions of Delhi exacerbates social and gender inequities (Biswas and Gangwar 2020; Truelove 2016; Zerah 2000). As a response to the situation, the Delhi government announced the Delhi Yamuna floodplain water storage project in 2019 to create multiple surface reservoirs and to recharge groundwater aquifers in the floodplains of the river Yamuna.

### Chennai

Chennai is the fourth largest urban agglomerate in India with an estimated population of 8.6 million inhabitants (Guntoju et al. 2019). Chennai ran out of ground water in June 2019 following three years of near-drought conditions, the situation reminiscent of the Day Zero crisis in Cape Town, South Africa. While the urban rich could afford water tankers, the poor had to line up for hours to manage even a bucket. News items reported hijacking of water tankers and violence breaking out in some neighborhoods (Bloomberg 2021). Hotels and restaurants were forced to close down temporarily due to such water shortage. The Chennai metro turned off air conditioning and many offices asked their employees to work from home to conserve water (BBC 2019). The water scarcity situation continues. The state government’s response includes the adoption of a new initiative, *City of 1000 tanks*, aimed at restoring older temple tanks and building new ones to recharge groundwater and store water for use during dry months.

### Bengaluru

Bengaluru, the Silicon Valley of Asia, is one of the fastest growing metropolitan cities in India. Its population has grown from about 10,000 per square kilometer in 2001 to 15,000 per square kilometer in 2020 (Chatterjee and Roy 2021). Like Chennai, Bengaluru shares an ancient tradition of water conservation through tanks. However, population growth and rapid urbanization have resulted in encroachment and pollution of water bodies with no major augmentation of water storage units and storage capacities taking place (Chatterjee and Roy 2021). The Bangalore Water Supply and the Sewerage Board (BWSSB), the nodal agency for providing drinking water is able to provide water to only about 60% of the city; most piped water is supplied to middle-class and elite households with poorer communities depending on shared hand pumps, wells, or private water markets who mine water from borewells in rural areas (Banerji 2019; Merchant et al. 2014). As an initiative to manage the scarcity, Bengaluru has launched wetland conservation drives.



The situations discussed above are a red-alert call for addressing the growing and deepening water-crises in various regions of India. We list key initiatives as responses in the next section.

*Policies and initiatives to address water scarcity.* The key initiatives to address water scarcity in India are as follows:

- Launched in 2019, the *Jal Shakti Abhiyan*, the Central Government's Water Conservation Drive encompasses 1592 water stressed blocks in 256 districts. This initiative prioritizes watershed development, rainwater harvesting and afforestation, and the reuse of water and renovation of traditional water bodies (Ministry of Jal Shakti 2017, 2019a, b; Tiwari 2019).
- The *Jal Jeevan Mission (JJM)* initiative aims to provide safe and adequate drinking water through individual tap connections to households in rural India (Ministry of Jal Shakti 2017, 2019a, b).
- The *Namami Gange Program*, a flagship program of the Union Government, is dedicated to the task of cleaning, conserving and rejuvenating the River Ganga, a major freshwater source for India, and also monitoring industrial effluents and sewerage treatment and creating public awareness around afforestation and biodiversity conservation (NMCG n.d.; PTI, 2020).
- Launched in 1974, the *Command Area Development and Water Management Program (CADWM)* commits to improvements in irrigation through efficient water management Ministry of Jal Shakti, 2017, 2019a, b. Field drainage, land shaping and levelling, and the reclamation of waterlogged and saline areas have been undertaken under this program. The CADWM program is also linked to the *Pradhan Mantri Krishi Sinchai Yojana (PMKSY)- Har Khet Ko Pani* (every field should have access to water). The program has covered over 150 irrigation projects spread across 29 states The *Inter-River linking project (IRL)* aims to link rivers in India to ensure greater equity in the distribution of water by enhancing the availability of water in drought prone and rain-fed area (Das Gupta 2020).
- Other government initiatives include organizing training camps to educate farmers on crop and water management and new technologies that regulate and manage supply of water (APHRDI n.d.). All these projects and initiatives report significant achievements.

As we note, most programs and schemes to address water scarcity are government and public sector-initiated. The situation is true for most developing nations as well where government-initiated programs predominate (Ministry of Water Resources 2018; Sumra et al. 2020; Veiga and Magrini 2013). Although a few private institutions such as the HSBC bank (Cobbing 2020) and the Tata Group's Tata Water Mission (TWM) (CEO Water Mandate n.d.) in India sponsor and encourage active involvement and participation of consumers in water-scarcity management initiatives, the lack of proactive consumer involvement is a significant concern. This means consumers are not responsabilized enough to address the water-scarcity crisis. The next few sections address these aspects.

### Scarcity: a sociocultural orientation

As we note in preceding sections, water-scarcity and related issues are a major challenge, especially so in developing country contexts, to the extent of causing much hardship and threatening the very survival of populations in these countries. The predominantly government sector and public institution-led approaches to managing water scarcity under-

emphasize and understate the significance of the sociocultural in meeting the challenge. We respond to this lack and under-emphasis in drawing on the sociocultural and in recognizing the significance of consumer participation in given socio-cultural contexts. We acknowledge the sacredness of nature as a philosophical orientation across most regions and countries. From a practical perspective, however, we envisage the key role of elite individuals in disseminating knowledge and mobilizing support and action to address the water-scarcity challenge.

**Sacredness of nature as a philosophical orientation.** Nature is regarded as sacred in most cultures and societies even though the forms and meanings of sacredness may vary. A number of societies and indigenous populations, for example, maintain a spiritual connection to the earth and nature and especially to water (Groenfeldt 2006). Landscapes and mountains are sacred in the Norwegian Sami tradition and culture (Kraft 2010). Major South Asian religions conflate nature and religion (Sivakumar et al. 2014). Traditions of the worship of the elements—earth, fire, water, air and space—including sacred trees and rivers prevail in the region (Anthwal et al. 2010; Haberman 2013). The Himalayan range of mountains, for example, are revered and the Ganga, Brahmaputra, and the Saraswati rivers are considered sacred and worshiped in India (Sivakumar et al. 2014). Water is tapu (sacred) in the Maori culture of New Zealand (Memon and Kirk 2012). Even when elusive in meaning, the belief in the “rejuvenating and sustaining capacities of outdoor experience” and in the value embodied in “the proliferation of campgrounds, conservation organizations, and outdoor programs of all sorts” and in the “spiritualities of nature” as reflected in the testimonies of authors and fiction characters remains (Gatta 2004, p 4). Nature appeals to our sensibilities, even if in different ways. This study recognizes this special place of nature in our lives, whether in a religious-sacred or spiritual sense or as something that is valued and cherished in our day to day lives. Even so, it turns attention to the need for concerted and practical measures to address the water scarcity challenge.

**Sociocultural theory.** Sociocultural orientations and approaches engage with the role of societies and cultures in human lives and experiences. Sociocultural theoretical perspectives consider the influence of sociocultural contexts and interactions in the development of individuals (Bandura 1986, 1997; Bronfenbrenner 1979; Vygotsky 1978). Children, for example, learn from beliefs and attitudes modeled by cultures. Culture is comprised of values, beliefs, norms and acceptable behaviors held in place through institutional structures such as family and communities and individuals (Cunningham and Reich 2006; Shavitt and Barnes 2020).

Vygotsky's (1978) sociocultural theory places emphasis on the “zone of proximal development” (p 86). The zone of proximal development according to Vygotsky is comprised of individuals such as peers, experts, and collaborators who influence levels of potential learning and development; and have a significant role to play in enhancing cognitive understandings. and meaning making for individuals. We turn attention to the potential role of elite individuals (those with significant sociocultural status and the ability to influence such as community leaders and others with relevant skills and expertise) in raising awareness, seeking support and solidarity, and mobilizing commitment and action to address water scarcity related issues and challenges in given socio-cultural contexts.

According to Vygotsky (1978), socio-cultural influences flow from the more knowledgeable other (MKO) to the less

knowledgeable and develop an individual's learning and thinking abilities and higher level functions in such process. Implicit in individual development is the individual's ability to evaluate and assess questions and issues relating to his or her well-being—both psychological (Ryff 1989; Ryff and Singer 2008) and social (Keyes 1998) well-being.

Vygotsky does not engage so much with whether and how an individual's development and well-being is tied to the community and community interests. Nor does he consider two-way or multi-directional flows and interactions and how these can influence the development and well-being of the community at large. In light of these natural linkages, we expand upon Vygotsky's focus from the individual to the community, and include community development and well-being within the scope of his theorizations. We further incorporate a responsibility dimension in Vygotsky's sociocultural theorizations. In other words, individual development is also linked to the ability to think critically and consider what choice and activity and action is appropriate and suited and "good for you" (Gurrieri et al. 2013, p 130) and also for the larger community. From such perspective, a well-developed individual must also be sufficiently responsible and accountable in terms of appropriate behaviors in given socio-cultural contexts. We link this sense of responsibility and responsibility to finding solutions to the water-scarcity challenge. In other words, well-developed individuals and consumers must be responsible enough to take upon themselves the task of standing up to the challenge of water scarcity to ensure their own and the community's well-being through proactive initiatives.

We propose pro-active initiatives by elite individuals to address the challenge of water scarcity.

We further turn attention to the need for considering a range of communication modes. Although Vygotsky speaks of knowledge flows from the more knowledgeable to the less knowledgeable in zones of proximal development, he does not consider the role of communication modes, for example traditional or non-traditional media and especially technology in the spread of information and ideas. Modes of communication have the potential to not only spread ideas and reinforce messages but to also significantly multiply the reach of appropriate messages in zones of proximal development. We thus further extend Vygotsky in including modes of communication in his theorizations.

We next consider the role of elite individuals in addressing the water-scarcity challenge.

**The role for elite individuals.** Elite individuals, that is those with significant sociocultural status and the ability to influence such as community leaders and others with relevant expertise and skills in zones of proximal development have a significant role to play in addressing natural resource scarcity, in this case water in given sociocultural contexts. Akin to social marketing, where commercial marketing theory and practice is adapted for purposes of guiding and supporting social change, we propose proactive roles for elite individuals in zones of proximal development to induce behaviors that benefit the community.

We identify and discuss three specific roles.

The first is in terms of constructing and communicating knowledge and meanings. Just as marketing and communication experts draw upon socio-cultural contexts to construct and communicate appropriate meanings (McCracken 1986), community leaders and individuals with specialized skills and expertise could come together and agree upon the most relevant knowledge and understandings of the water scarcity challenge and disseminate the same within their communities.

A second key role for elite individuals is to call for action. Elite individuals could appeal to individuals and communities to take individual and collective responsibility for managing the water scarcity challenge. Here, we refer to the need for consumer-centered and consumer-driven initiatives to respond to the water scarcity challenge. This could be accomplished through marketing and communication programs and campaigns that link individual and community well-being to proactive and supportive measures (Kipp and Hawkins 2019).

Visual representations of water-scarcity in media, for e.g., through brochures, local television, and social media, and the need to take practical measures could prove useful to accomplish such objective. Special incentives—monetary and social recognition—could be publicized to encourage participation. Depending on demographics and spread, a choice of media effective at local levels such as loudspeakers, radio, television, and social media could be used to organize rallies and mobilize support. Messages and meetings could be arranged at places with significant footfall. These could include banks, community centers and panchayats, and government health care units to ensure visibility and spread. Formal ceremonies to honor noteworthy initiatives at local, regional, and national level with monetary awards and social recognition could further incentivize participation.

A third role for elite individuals would be to facilitate the process of consumer-involvement and consumer-initiatives, for example, in terms of enlisting support and arranging for sponsorships, trainings and consultation camps, and in forging partnerships with organizations interested in supporting consumer-initiatives. These key roles of elite individuals tie-in with the three levels of consumer and community participation we discuss below in "Managing water-scarcity" section.

### Managing water-scarcity

The predominant approach to managing water-scarcity in developing-country contexts as we observe is government or public-sector-driven. We draw on the idea of responsabilizing consumers in managing the water-scarcity situation. We propose independent and supported consumer-centered and consumer-driven water-scarcity management initiatives to complement the current at three levels—the individual, the community and at industry-consumer partnership levels. We explain each as follows:

**Individual-level.** We suggest the need for consumers to take responsibility at the individual level. This means consumers must focus on what they can do to reduce water consumption and minimize the impact on water supplies. For example, they could be mindful of wasteful habits and adopt responsible behaviors such as restricting showering-time and taking shorter showers, monitoring washing machine usage and using the washer for only full loads, installing low or dual flush models and adjustable toilet-flappers, watering lawns and gardens responsibly and not leaving the water running inside the home in sinks or in lawns. Such initiatives could reduce household water consumption. Consumers could also install cheap and easy-to-use home-based technologies and devices to harvest, conserve and recycle waters. For example, they could use large-sized drums to save and store rainwater. They could employ simple do-it-yourself techniques and processes such as combinations of salt, water, and electricity to produce chlorine that kills bacteria to recycle or to purify harvested water.

Regulatory interventions such as usage restrictions and conservation pricing could facilitate responsible behaviors at individual levels; and awareness building programs and practical demonstrations and trainings as well as incentives in the form of subsidies could encourage the adoption of home-based

technological interventions. Key to such individual-driven responsibility is the consciousness of the water-scarcity challenge both in the short and long-term. Clearly, this means building levels of awareness and commitment to addressing the challenge. Initiatives by elite individuals and measures such as personal meets, rallies, education, and the spread of ideas through locally effective communication modes such as the radio and the local newspaper could go a long way in developing and circulating knowledge and being solution-oriented.

**Community-level.** A community-level approach to the water-scarcity challenge is critical for successful water-scarcity management. Communities can play a significant role to ensure responsible water consumption, conservation and disposal. Volunteer Groups could engage in educating populations. Learning materials such as pamphlets and brochures could be distributed through local panchayats and post offices. Media and technology could be used to train communities on efficient use of water resources through educational films and demonstrations. Meets and dialogs within and across communities could be arranged to exchange and discuss best practices such as water conservation and efficient use of water resources.

Self-organized and voluntary bodies could monitor household and industry water consumption in the community and negotiate agreements on responsible usage and disposal. Community volunteer groups could also monitor water pollution and water contamination especially from industrial wastes and push for industry to install waste water treatment plants and use recycled water for industrial purposes. Besides, communities could track ground water extraction and levels and set up community water storage and treatment facilities. Sharing of resources (Belk 2010) such as water storage facilities could go a long way in managing scarcity. Automated dispensing units at places that are cramped, receive heavy footfall or have concentrated populations could ensure safe water supplies. These units, for example, could be installed at local health centers, panchayats, postal offices, and banks.

Community level initiatives could include the harnessing of solar power to desalinate and decontaminate water thereby preserving and making more water available for consumption. A range of equipment (Optimum water solutions 2021) that distill water from different sources are now available and could be installed as community investment projects. Similarly, other technologies such as 30 feet tall towers that collect several gallons of water a day by catching droplets of dew as it rolls down in containers, could be effective in certain geographic areas. Waste water treatment using physical, chemical and biological processes could be an on-going community initiative (How to improve water quality 2020). Importantly, the value of green agriculture could be popularized. The water we consume daily through food is much more than we drink, and estimates suggest that 2000–5000 l of water is used to produce the food consumed by a single person (Food and Agriculture Organization of the United Nations 2017). Appropriate and climate-friendly crop choices could therefore go a long way in reducing the levels of water needed to produce these crops.

Public awareness around the challenges and solutions to water-scarcity could encourage responsible consumption and proactive initiatives. Tax benefits and incentives amongst other measures could keep consumers sufficiently motivated to use and recycle water responsibly.

**Industry-consumer partnership level.** Although we see some private sector support for water management initiatives in developing country contexts, we do not see as much

involvement of consumers at individual and community and grassroots levels. Only a few programs enlist the active support of individuals and communities. For example, the HSBC supported water scarcity initiative in Satara in India mobilizes and responsabilizes rural communities to access clean and equal water resources (Coro n.d.). Rural residents under this initiative survey water sources and existing structures, plan on upgrading existing structures and gather funds to do so. However, such effort could be replicated across India's landscape. Consumers themselves could take the initiative and self-organize to do the same at their own level by identifying supportive organizations with an interest in local communities such as well-established hospital chains, banks, agri-businesses, internet service providers, large-scale retailers such as Reliance, and private businesses and forge partnerships to manage water-scarcity related issues and challenges.

Successful noteworthy initiatives include, for example, the Clinton Health Access Initiative (CHAI) in partnership with Tata Trusts (in India) that aims to provide safe drinking water to rural communities in India (Dabas and Bainsla 2020). The CHAI-Tata partnership piloted a community entrepreneurship model in 2018 in the tribal district of Dhar in India engaging a local entrepreneur to co-invest 50% of the project cost. Although this initiative reports success with the pilot making a regular net profit, the larger rollout of the initiative is awaiting co-investors. One option in such a situation could be to involve more community members and subsidizing costs at grassroots level.

While supportive measures in the nature of education and trainings could go a long way in meeting the water scarcity challenge, innovative private sector-community partnership models could open up more options. Here, we draw on the Netherlands example where water companies incorporated as private entities include national and local governments as majority shareholders and involve citizens through social business models that appoint them as guardians to report on various water supply and usage aspects (BASF n.d.). Such initiatives responsabilize consumers in making proactive commitments to addressing the challenge of water-scarcity even more. In line with the above discussion, we call for more consumer-centered and consumer-driven industry-community partnerships and collaborations to address and manage the water scarcity crisis in developing country contexts. Such partnerships and collaborations could be incentivized through tax-rebates and subsidies.

## Conclusion and future research

To conclude, this paper broadens current understandings of scarcity in the academic literature. It has focused on a relatively understudied scarcity type and has responded to Hamilton et al. (2019) call to engage with “types of resources” (p 543). The paper turns attention to the need for consumer responsabilization in responding to natural resource scarcity—the threat of which is growing and has serious implications for human life and survival. Consumer responses carry much relevance and meaning for their own as well as the community and societal good in certain scarcity types and elite individuals can play a significant role in responsabilizing consumers and facilitating proactive consumer initiatives to address these. Future studies could consider how consumers organize to address different types of scarcities and the nature and kind of individual and community involvement in each. Theoretically, the paper has extended Vygotsky in the focus on communities and well-being and in responsabilizing consumers and in the need to engage suitable modes of communication. In terms of managing water-scarcity, the paper suggests practical measures at three



levels—the individual, the community and in community-industry partnerships. Future research could deliberate alternative consumer-centered approaches, structures and frameworks to address natural resource scarcities.

### Data availability

Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

Received: 13 April 2021; Accepted: 21 March 2022;

Published online: 21 April 2022

### References

- Aggarwal P, Jun SY, Huh JH (2011) Scarcity messages. *J Advert* 40(3):19–30
- Anthwal A, Gupta N, Sharma A, Anthwal S, Kim KH (2010) Conserving biodiversity through traditional beliefs in sacred groves in Uttarakhand Himalaya, India. *Resour Conserv Recycl* 54(11):962–971
- APHRDI. (n.d.). Command Area Development and Water Management (CADWM) Programme. Andhra Pradesh Human Resource Development Institute, Bapatla. <https://aphrdi.ap.gov.in/documents/Trainings@APHRDI/AEEs/Srikalahasthi/presentations/iv%20week/abdul%20Basherr/Directorate%20of%20CAD-PIM.pdf>. Accessed 5 Jan 2021
- Bandura A (1986) *Social foundations of thought and action: a social cognitive theory*. Prentice-Hall, Inc, New Jersey
- Bandura A (1997) *Self-efficacy: the exercise of control*. W.H. Freeman & Co, New York, NY
- Banerji A (2019) Bengaluru water crisis: More work, less water in India's 'Silicon Valley'. *Mint*. <https://www.livemint.com/news/india/bengaluru-water-crisis-more-work-less-water-in-india-s-silicon-valley-1559718058529.html>
- Bartels LE, Bruns A, Alba R (2018) The production of uneven access to land and water in peri-urban spaces: de facto privatisation in greater Accra. *Local Environ* 23(12):1172–1189
- BASF (n.d.). India's urban water crisis calls for an integrated approach. BASF. <https://www.basf.com/in/en/who-we-are/sustainability/future-perfect/stories/urban-water-crisis.html#:~:text=We%20need%20solutions%20that%20address,citizens%20and%20other%20stake%20holders>
- Basu M & Shaw R (2013). Water Scarcity and migration: an Indian perspective. *Water Insecurity*. [https://doi.org/10.1108/s2040-7262\(2013\)0000013015](https://doi.org/10.1108/s2040-7262(2013)0000013015)
- BBC (2019) Chennai water crisis: cities reservoirs run dry. *BBC News*. <https://www.bbc.com/news/world-asia-india-48672330>
- Belk RW (2010) Sharing. *J Consum Res* 36(5):715–734
- Biswas A, Gangwar D (2020) Studying the water crisis in Delhi due to rapid urbanisation and land use transformation. *Int J Urban Sustain Dev* 13:1–15
- Bloomberg (2021) How Chennai-one of the world's wettest cities-ran out of water. *Mint*. <https://www.livemint.com/news/india/how-chennai-one-of-the-world-s-wettest-major-cities-ran-out-of-water-11612412943308.html>
- Boretti A, Rosa L (2019) Reassessing the projections of the world water development report. *NPJ Clean Water* 2(1):1–6
- Bronfenbrenner U (1979) *The ecology of human development: experiments by nature and design*. Harvard University Press, Cambridge.
- Carrard N, Foster T, Willetts J (2019) Groundwater as a source of drinking water in southeast Asia and the Pacific: a multi-country review of current reliance and resource concerns. *Water* 11(8):1605
- CEO Water Mandate. (n.d.). The Tata Water Mission. UN Global Compact. <https://ceowatermandate.org/resources/tata-water-mission-2/>
- Chatterjee B, Roy A (2021). Creating urban water resilience in India. A water balance study of Chennai, Bengaluru, Coimbatore and Delhi. Observer Research Foundation, New Delhi. [https://www.orfonline.org/wp-content/uploads/2021/03/Monograph\\_Urban\\_Water.pdf](https://www.orfonline.org/wp-content/uploads/2021/03/Monograph_Urban_Water.pdf). Accessed 13 Mar 2021
- Cobbing J (2020) WaterAid multi-country research on water security: HSBC Water Programme. <https://washmatters.wateraid.org/sites/g/files/jkxooof256/files/wateraid-multi-country-research-on-water-security-hsbc-water-programme.pdf>. Accessed 19 Feb 2021
- Coro. (n.d.). Water scarcity, Satara. Coro India. <http://coroindia.org/what-we-do/regional-campaigns/water-scarcity>
- Cunningham L, Reich JJ (2006) *Culture and values: a survey of the humanities*. Thomson/Wadsworth, Belmont, CA
- Dabas H, Bainsla N (2020) Leveraging rural entrepreneurs to provide safe drinking water. Clinton Health Access Initiative. <https://www.clintonhealthaccess.org/leveraging-rural-entrepreneurs-to-provide-safe-drinking-water/>
- Das Gupta M (2020) States not on board, regulatory roadblocks-NDA's river-linking project flows nowhere. *The Print*. <https://theprint.in/india/states-not-on-board-regulatory-roadblocks-ndas-river-linking-project-flows-nowhere/376849>
- Desai D (2019) Quality of water in India's state capitals. Observer Research Foundation (ORF). <https://www.orfonline.org/expert-speak/quality-of-water-in-indias-state-capitals-58308/>
- Detges A (2016) Local conditions of drought-related violence in sub-Saharan Africa: the role of road and water infrastructures. *J Peace Res* 53(5):696–710
- Dwivedi S, Mishra S, Tripathi RD (2018) Ganga water pollution: a potential health threat to inhabitants of Ganga basin. *Environ Int* 117:327–338
- Evans A (2010) Resource scarcity, climate change and the risk of violent conflict. World Bank- World Development Report 2011 (background paper). [https://openknowledge.worldbank.org/bitstream/handle/10986/9191/WDR2011\\_0024.pdf?sequence=2&isAllowed=y](https://openknowledge.worldbank.org/bitstream/handle/10986/9191/WDR2011_0024.pdf?sequence=2&isAllowed=y). Accessed 16 Mar 2021
- Food and Agriculture Organization of the United Nations (2017) Water Scarcity— one of the greatest challenges of our time. <https://www.fao.org/zhc/detail-events/en/c/8808881/>. Accessed 18 Mar 2022
- Gatta J (2004) *Making nature sacred: Literature, religion, and environment in America from the Puritans to the present*. Oxford University Press, Oxford.
- Gierl H, Huettl V (2010) Are scarce products always more attractive? The interaction of different types of scarcity signals with products' suitability for conspicuous consumption. *Int J Res Market* 27(3):225–235
- Groenfeldt D (2006) Water development and spiritual values in western and indigenous societies. *Water Indig Peoples Knowl Nat* 108–115.
- Guntoju SS, Alam MF, Sikka A (2019) Chennai water crisis: a wake-up call for Indian cities. *Down To Earth*. <https://www.downtoearth.org.in/blog/water/chennai-water-crisis-a-wake-up-call-for-indian-cities-66024>
- Gurrieri L, Previte J, Brace-Govan J (2013) Women's bodies as sites of control: inadvertent stigma and exclusion in social marketing. *J Macromarketing* 33(2):128–143
- Haberman DL (2013) *People trees: worship of trees in northern India*. Oxford University Press, Oxford
- Hamilton R, Thompson D, Bone S, Chaplin LN, Griskevicius V, Goldsmith K, Hill R, Roedder John D, Mittal C, O'Guinn T, Piff P, Roux C, Shah A, Zhu M (2019) The effects of scarcity on consumer decision journeys. *J Acad Marketing Sci* 47(3):532–550
- Hamilton R (2020) Scarcity and coronavirus. *J Public Policy Marketing* 40(1):99–100
- Hammer B (2017). For clean water, we need to invest in infrastructure. Natural Resources Defense Council. <https://www.nrdc.org/experts/becky-hammer/clean-water-we-need-invest-in-infrastructure>
- Hasan MK, Shahriar A, Jim KU (2019) Water pollution in Bangladesh and its impact on public health. *Heliyon* 5(8):e02145
- Hassan OM, Tularam GA (2018) The effects of climate change on rural-urban migration in Sub-Saharan Africa (SSA)—the cases of Democratic Republic of Congo, Kenya and Niger. *Appl Water Syst Manage Model*. <https://doi.org/10.5772/intechopen.72226>
- Heijden, D. V. K., & Stinson, C. (2019, March 18). Water is a growing source of global conflict. Here's what we need to do. *World Economic Forum*. <https://www.weforum.org/agenda/2019/03/water-is-a-growing-source-of-global-conflict-heres-what-we-need-to-do/>
- Hota RM (2020). India's water crisis: Is there a solution? *The Financial Express*. <https://www.financialexpress.com/lifestyle/science/indias-water-crisis-is-there-a-solution/2089860/>
- How to improve water quality (2020). <https://solarimpulse.com/water-pollution-solutions#>
- Huang H, Liu SQ, Kandampully J, Bujisic M (2020) Consumer responses to scarcity appeals in online booking. *Ann Tour Res* 80:102800
- IDMC (2017) Case study series—dam displacement. Internal Displacement Monitoring Centre. <https://www.internal-displacement.org/publications/case-study-series-dam-displacement>
- India Today Web Desk (2019) World Water Day: India is 3rd largest groundwater exporter, but 21 cities are running out of water by 2020! *India Today*. <https://www.indiatoday.in/science/story/world-water-day-2019-water-crisis-india-1483777-2019-03-22>
- Johnson H, South N, Walters, R (2015) The commodification and exploitation of fresh water: property, human rights and green criminology. *Int J Law Crime Justice*. <https://doi.org/10.1016/j.ijlcrj.2015.07.003>
- Kant A (2018) Composite Water Management Index (CWMI). NITI Aayog. [https://niti.gov.in/writereaddata/files/new\\_initiatives/presentation-on-CWMI.pdf](https://niti.gov.in/writereaddata/files/new_initiatives/presentation-on-CWMI.pdf). Accessed 8 Mar 2021
- Keyes CLM (1998) Social well-being. *Soc Psychol Q* 61:121–140
- Kiik L (2020) International conspiracy? Speculating on the Myitsone Dam controversy in China, Burma, Kachin, and a displaced village. *Geopolitics*. <https://doi.org/10.1080/14650045.2020.1808886>
- Kipp A, Hawkins R (2019) The responsabilization of “development consumers” through cause-related marketing campaigns. *Consum Markets Culture* 22(1):1–16
- Koop SHA, Van Dorssen AJ, Brouwer S (2019) Enhancing domestic water conservation behaviour: a review of empirical studies on influencing tactics. *J Environ Manage* 247:867–876



- Kraft SE (2010) The making of a sacred mountain. Meanings of nature and sacredness in Sápmi and northern Norway. *Religion* 40(1):53–61
- Lakmeeharan K, Manji Q, Nyairo R, Poeltner, H (2020) Solving Africa's infrastructure paradox. McKinsey & Company, New York. <https://www.mckinsey.com/business-functions/operations/our-insights/solving-africas-infrastructure-paradox>
- LeSieur LJ, Burke BL, Harvey A (2018) Water in conflict: water scarcity, epidemics and war. NFHS. <https://www.nfhs.org/media/1019430/water-in-conflict.pdf>. Accessed 15 Jan 2021
- Mancosu N, Snyder RL, Kyriakakis G, Spano D (2015) Water scarcity and future challenges for food production. *Water* 7(3):975–992
- Mangi F, Kay C, Chaudhary A (2019). Water crisis brews between India and Pakistan as rivers run dry. *The Economic Times*. <https://economictimes.indiatimes.com/news/politics-and-nation/water-crisis-brews-between-india-and-pakistan-as-rivers-run-dry/articleshow/67700195.cms?from=mdr>
- McCracken G (1986) Culture and consumption: a theoretical account of the structure and movement of the cultural meaning of consumer goods. *J Consum Res* 13(1):71–84
- Mehta L (2010) The limits to scarcity. Earthscan, London
- Memon PA, Kirk N (2012) Role of indigenous Māori people in collaborative water governance in Aotearoa/New Zealand. *J Environ Plan Manage* 55(7):941–959
- Merchant A, Kumar MM, Ravindra PN, Vyas P, Manohar U (2014) Analytics driven water management system for Bangalore city. *Proced Eng* 70:1137–1146
- Miletto M, Caretta MA, Burchi FM, Zanlucchi G (2017) Migration and its interdependencies with water scarcity, gender and youth employment. UNESCO Publishing, Paris
- Miletto M, Caretta MA, Burchi FM, Zanlucchi G (2017) Migration and its interdependencies with water scarcity, gender and youth employment. WWAP. UNESCO, Paris. Retrieved March 11, 2021 from [https://www.womenforwater.org/uploads/7/7/5/1/77516286/migration\\_and\\_its\\_interdependencies\\_with\\_water\\_scarcity\\_gender\\_and\\_youth\\_employment\\_unesco\\_wwap\\_2017.pdf](https://www.womenforwater.org/uploads/7/7/5/1/77516286/migration_and_its_interdependencies_with_water_scarcity_gender_and_youth_employment_unesco_wwap_2017.pdf)
- Ministry of Jal Shakti (2017) CADWM Programme background. <http://mowr.gov.in/programmes/cadwm-programme-background>. Accessed 9 Feb 2021
- Ministry of Jal Shakti (2019a) Report on Jal Shakti Abhiyan outcomes and learnings. [https://sujal-swachhsangraha.gov.in/sites/default/files/JSA%20Report\\_V3.pdf.pdf](https://sujal-swachhsangraha.gov.in/sites/default/files/JSA%20Report_V3.pdf.pdf). Accessed 4 Mar 2021
- Ministry of Jal Shakti (2019b) Operational Guidelines for the Implementation of Jal Jeevan Mission. [https://jaljeevanmission.gov.in/sites/default/files/jjm\\_ebook/mobile/index.html#p=1](https://jaljeevanmission.gov.in/sites/default/files/jjm_ebook/mobile/index.html#p=1). Accessed 23 Feb 2021
- Ministry of Water Resources (2018) National Water Policy. <https://waterbeyondborders.net/wp-content/uploads/2018/07/Pakistan-National-Water-Policy-2018.pdf>. Accessed 18 Feb 2021
- Mishra A (2019) Issues of large-scale dam resettlement and rehabilitation: case of Bilaspur, Himachal Pradesh. *Indian J Public Admin* 65(4):848–868. <https://doi.org/10.1177/0019556119873444>
- Monroe KB, Zoltners AA (1979) Pricing the product line during periods of scarcity. *J Market* 43(3):49–59
- Narayanamoorthy A, Venkatchalam L (2018) Farmer's right to water. *Hindu Business Line*. <https://www.thehindubusinessline.com/opinion/farmers-right-to-water/article20337532.ece1>
- National Geographic Society (2019) Water inequality. *National Geographic*. <https://www.nationalgeographic.org/article/water-inequality/>
- NITI Aayog, Ministry of Water Resources, Ministry of Drinking Water & Sanitation & Ministry of Rural Development (2018) Composite water management index: a tool for water management. [https://niti.gov.in/writereaddata/files/document\\_publication/2018-05-18-Water-Index-Report\\_vs8-compressed.pdf](https://niti.gov.in/writereaddata/files/document_publication/2018-05-18-Water-Index-Report_vs8-compressed.pdf). Accessed 17 Feb 2021
- NMCG. (n.d.). Namami Gange Programme. National Mission for Clean Ganga. <https://nmcg.nic.in/NamamiGanga.aspx>. Accessed 16 Feb 2021
- Okii T, Quiocho RE (2020) Economically challenged and water scarce: identification of global populations most vulnerable to water crises. *Int J Water Resour Dev* 36(2-3):416–428
- Optimum Water Solutions (2021) New technologies to help solve the water crisis. <https://www.drinkoptimum.com/new-technologies-to-help-solve-the-water-crisis/>
- Ordbayeva N, Chandon P (2011) Getting ahead of the Joneses: When equality increases conspicuous consumption among bottom-tier consumers. *J Consum Res* 38(1):27–41
- Page C (1992) A history of conspicuous consumption. In: Rudmin FW, Richins M Eds SV-meaning, measure, and morality of materialism. Association for Consumer Research, Provo, UT, p 82–87
- Petersen-Perlman JD, Veilleux JC, Wolf AT (2017) International water conflict and cooperation: challenges and opportunities. *Water Int* 42(2):105–120
- Prüss-Ustün A, Wolf J, Bartram J, Clasen T, Cumming O, Freeman MC, Johnston R (2019) Burden of disease from inadequate water, sanitation and hygiene for selected adverse health outcomes: an updated analysis with a focus on low- and middle-income countries. *Int J Hygiene Environ Health* 222(5):765–777
- Prüss-Ustün A, Bartram J, Clasen T, Colford Jr JM, Cumming O, Curtis V, Cairncross S (2014) Burden of disease from inadequate water, sanitation and hygiene in low- and middle-income settings: a retrospective analysis of data from 145 countries. *Trop Med Int Health* 19(8):894–905
- PTI (2020) Namami Gange mission: PM Modi inaugurates six sewage treatment plants in Uttarakhand. *The Economic Times*. <https://economictimes.indiatimes.com/news/politics-and-nation/namami-gange-mission-pm-modi-inaugurates-six-sewage-treatment-plants-in-uttarakhand/articleshow/78388154.cms>
- Qureshi WA (2017) Water as a human right: a case study of the Pakistan-India water conflict. *Penn St. J Int'l Aff* 5:374
- Rijsberman FR (2006) Water scarcity: fact or fiction? *Agric Water Manage* 80(1-3):5–22
- Ryff CD (1989) Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *J Person Soc Psychol* 57(6):1069
- Ryff CD, Singer BH (2008) Know thyself and become what you are: a eudaimonic approach to psychological well-being. *J Happiness Stud* 9(1):13–39
- Salerno A, Sevilla J (2019) Scarce foods are perceived as having more calories. *J Consum Psychol* 29(3):472–482
- Schmeier S, Hartog J, Kortlandt J, Meijer K, Meurs E, Sasse R, ter Horst R (2019). Water scarcity and conflict: Not such a straightforward link. The European Centre for Development Policy Management (ECDPM). <https://ecdpm.org/great-insights/complex-link-climate-change-conflict/water-scarcity-conflict/>
- Shavitt S, Barnes AJ (2020) Culture and the consumer journey. *J Retail* 96(1):40–54
- Sivakumar KP, A. S. Nair AS, Jaya DS (2014) Indigenous reverence for environment: a review on sacred groves in India. International Conference on Indigenous Initiatives for Environment and Development, Ethiopia
- Stanley M (1968) Nature, culture and scarcity: foreword to a theoretical synthesis. *Am Sociol Rev* 33(6):855. <https://doi.org/10.2307/2092679>
- Sultana P, Thompson PM, Paudel NS, Pariyar M, Rahman M (2019) Transforming local natural resource conflicts to cooperation in a changing climate: Bangladesh and Nepal lessons. *Clim Policy* 19(sup1):S94–S106
- Sumra K, Mumtaz M, Khan K (2020) National water policy of Pakistan: a critical. *Analysis*. 14:60–70
- Suri R, Kohli C, Monroe KB (2007) The effects of perceived scarcity on consumers' processing of price information. *J Acad Market Sci* 35(1):89–100
- Tiwari S (2019) Jal Shakti Abhiyan: Govt's water conservation campaign to cover 256 districts across nations. *India Today*. <https://www.indiatoday.in/india/story/jal-shakti-abhiyan-water-conservation-campaign-to-cover-256-districts-across-nation-1560055-2019-07-01>
- Treacy J (2019) Drinking water treatment and challenges in developing countries. In Potgieter N, Hoffman ANT (eds) The relevance of hygiene to health in developing countries. <https://doi.org/10.5772/intechopen.80780>
- Tuelove Y (2016) Incongruent waterworlds: Situating the everyday practices and power of water in Delhi. *South Asia Multidiscip Acad J*. <https://doi.org/10.4000/samaj.4164>
- Tzanakakis VA, Paranychanakis NV, Angelakis AN (2020) Water supply and water scarcity. *Water* 12(9):2347. <https://doi.org/10.3390/w12092347>
- UN Framework Team (United Nations Interagency Framework Team for Preventive Action) (2012) Renewable Resources and Conflict. The United Nations. [https://www.un.org/en/land-natural-resources-conflict/pdfs/GN\\_Renew.pdf](https://www.un.org/en/land-natural-resources-conflict/pdfs/GN_Renew.pdf)
- UNICEF, WHO (2019) 1 in 3 people globally do not have access to safe drinking water. <https://www.who.int/news/item/19-06-2019-1-in-3-people-globally-do-not-have-access-to-safe-drinking-water-unicef-who>
- UN Water (2020) Water scarcity. United Nations Water. <https://www.unwater.org/water-facts/scarcity/>
- Veblen T (1925) The theory of the leisure class: an economic study of Institutions. Unwin, London
- Veiga L, Magrini A (2013) The Brazilian water resources management policy: fifteen years of success and challenges. *Water Resour Manage*. <https://doi.org/10.1007/s11269-013-0288-1>
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press, Harvard
- Water Aid (2019) Beneath the Surface: the State of the World's Water. <https://washmatters.wateraid.org/sites/g/files/jkxooof256/files/beneath-the-surface-the-state-of-the-worlds-water-2019-.pdf>
- Winschewski J (2017) Putting a price tag on human rights. An anthropological perspective on Nestle's drinking water Privatisation in Pakistan. *Prace Etnograficzne* 45(2):175–195
- World Trade Organization. (2010). *World Trade Report 2010: trade in natural resources*. [https://www.wto.org/english/res\\_e/booksp\\_e/anrep\\_e/world\\_trade\\_report10\\_e.pdf](https://www.wto.org/english/res_e/booksp_e/anrep_e/world_trade_report10_e.pdf)
- Xenos N (1989) *Modernity and scarcity*. Routledge, London and New York, NY
- Zerah MH (2000) *Water: unreliable supply in Delhi*. Manohar Publishers, Delhi
- Zhu M, Ratner RK (2015) Scarcity polarizes preferences: the impact on choice among multiple items. *J Market Res* 52(1):13–26

**Acknowledgements**

None.

**Competing interests**

The authors declare no competing interests.

**Ethical approval**

This article draws upon existing literature and secondary sources of information and as per institutional guidelines, ethical approval was not necessary for this study.

**Informed consent**

This article does not contain any studies with human participants performed by any of the authors.

**Additional information**

**Correspondence** and requests for materials should be addressed to Renu Emile.

**Reprints and permission information** is available at <http://www.nature.com/reprints>

**Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

© The Author(s) 2022