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Review

Overcoming Barriers to Water Conservation with Behavioral Nudges In Sub Saharan Africa

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Abstract:

Growing water shortages for large regions of the arid regions of the world, are likely to become more recurrent as climate change impacts grow. Countries across the world are facing water security difficulties that stem from population growth, urbanization, and rapid industrialization. The use of behavioral nudges methods implemented to encourage a socially desired behavior at a low to zero cost, has been an effective method at reducing water consumption in places where they have been deployed. For example, studies in California USA, Barcelona Spain, and Australia indicate that adoption of nudges give significant positive results in water consumption reduction. We describe some of the barriers that make it difficult to implement behavioral nudges to address the water crises in Sub-Saharan Africa (SSA). We investigate the literature available in Sub-Saharan Africa and discover that the application of behavioral nudges has been sparingly used for reasons that are not obvious at first glance. Second, we find that the potential impediments to the use of behavioral nudges in SSA to be awareness, inadequate access to science and technology, political systems that are poorly suited for implementing nudging, abundance of multiple ethnic groups that speak different languages, along with other barriers that could challenge implementation of behavioral nudges. In light of those barriers, we present a conceptual model with a potential to address these barriers to behavioral nudging a workable solution in SSA.

Keywords: Behavioral nudges; water conservation; technology; water efficiency

1. Introduction

Behavioral nudges, defined as positive reinforcement and indirect suggestions as ways to influence the behavior and decision-making of groups or individuals, have the potential to see application to meet water conservation objectives in Sub-Saharan Africa. The adoption of behavioral nudge interventions are gaining tractions across different spectrums of society, from energy and water conservations, heathy eating, school enrolments, alcohol and drug use, gambling, and charitable donations among other applications (Croson & Shang, 2008; Shafir, 2013). The United States and United Kingdom have setup departments in their various governments that utilize behavioral nudges for combating various nagging societal ills. These teams work with policymakers to implement insights from the literature on behavioral nudges to encourage and enable individuals to make decisions that improve private and social wellbeing (Bernedo et al., 2014). This is not just a government thing; the private sector has been mobilizing this approach and providing policies grounded in the behavioral nudge philosophies. For example, consumer products and water utilities meet their efficiency objectives through the use of targeted messages designed to promote reductions in residential energy or water use (Wendel, 2016).

What is the function of behavioural nudge in water conservation? It is to inexpensively, subtly, speak to the consciences of the people the need to save water,

without being overtly direct, imposing or overbearing. For example, if the utility company put a leaflet in your bill, stating how much your neighbor saved, that in itself is not confrontational, nor is there anything in that bill that is mandating you to do likewise. But that information can prod you to do likewise, that means you have been nudged. Behavioral nudges are egalitarian, inexpensive and can be applied in nearly all of life's issues.

Water conservation across the world has utilized behavioral nudges to avert impending water crises. The city of Cape Town suffered a severe water crisis from 2016 to 2018. At the peak of the drought in South Africa's Western Cape- unambiguous information about the severity of the crisis and regularly communicating to the residents improved water situation at the height of the drought (Brühl & Visser, 2021). As the message was heeded, the situation was averted. Still in South Africa, a randomized control trial at 105 schools explored the impact of two behavioral nudges to inspire responsible water usage, water usage data feedback from smart meters, and an interschool competition showed reduced water use in these schools by 15–26% (Visser et al., 2021). The United States is a big player in the agricultural sector and therefore uses extensive amount of water. In 2014 alone spent $28 billion on different conservation efforts (Ferraro et al., 2017). And these efforts involve different conservation scheme, including behavioral nudges.

Numerous works have analyzed polices for conserving water using behavioral nudges (Moglia et al., 2018). One possible first step in this process of water conservation using behavioral nudges is providing information to the people about the importance of water saving and providing requisites background information on the importance of water conservation to the population (Syme et al., 2016). Awareness in the case of water conservation have been credited to be impactful where available (Kagoya et al., 2018). It has been found that media information campaigns are indispensable in creating more educated or informed and rational water users (Antwi et al., 2022; Pretorius et al., 2021). Apart from awareness through media, others have hinted at the important role good institutions play. Considerable costs are needed to bring about both technology and robust institutions that sustain the principle of behavioral nudging, though the methods of behavioral nudging themselves need not be costly.

Things that are antithetical to efficient deployment of behavioral nudges are numerous, from inadequate infrastructure, institutions, education, and more. For example, most of the farmers in sub–Saharan Africa (SSA) are in rural areas, which lack basic amenities, such as electricity supply, piped water, tarred roads, etc. In addition, they have inadequate education. They are mainly unable to read and write; they cannot read and write in any language, including their own languages which is problematic to implementing behavioral nudge concepts (Aina L.O., 2006). This paper provides a conceptual framework of water conservation with behavioral nudges interventions with a special interest in sub-Saharan Africa. And what are some of barriers to its effectiveness in sub–Saharan Africa (SSA). Looking at such things as infrastructures, technology, and institutions that enabled behavioral nudges thrive in the west and delay implementation in SSA.

1.1. Previous work

The use of social or peer comparison to inform resources reduction and sustainability is well established. Böhm et al., (2020) asserted that the knowledge of behavioral nudge increases individual contributions to long-term climate change mitigation, a default nudge and the self-commitment nudge, increased long-term contributions by almost 50%. In the United Kingdom it was it reported that Her Majesty's Revenue and Customs (HMRC) achieved the goal of growing the number of people paying their tax on time by 15 per cent using a letter informing the recipients that majority of people in their postcode had already paid (The Guardian, 2013). This practice is known as peer or social comparison or benchmarking. The work of Allcott, (2011) indicated what behavioral nudges have contributed in the commercial setting. OPOWER is an American company that sends home energy reports to residential utility customers comparing their electricity use to that

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of their neighbors. Using information from randomized experiments with 600,000 treatment and control households across the United States, they found that on average the program reduces energy consumption by 2.0% (Allcott, 2011; Sudarshan, 2014).

Behavioral nudges can advance conservation by methodically identifying behavioral barriers to conservation and how to best overcome them. Reddy et al., (2017) enumerated some of the factors that may work against the application of behavioral nudges. Time constraints, incentivizing behavior, money, technology and requisite knowledge on how to conserve water were among the barriers to behavioral nudging (Reddy et al., 2017). It can correspondingly be perceived negatively by those who view the method of behavioral nudges as paternalistic and undermining autonomy (Felsen et al., 2013). For example, in advanced society like the United States where people place a high value on the concept of freedom, it is not out of place for people to see nudge applications as paternalistic, and patronizing. Sunstein, (2013) opined that if the decision maker(s) has strong opinion, interest, or preference for a particular choice, it can affect the outcome of behavioral nudging.

The rising adoption and effectiveness of behavioral nudges in high income countries like the United States and Europe may be impractical in middle income and poor countries. For example, peer comparison has been deemed a gold standard to increasing tax revenue in the west (The Guardian, 2013). But the story is different in Poland , a middle income country, a World Bank pilot program reaching 150,000 people observed that punitive language improved tax compliance more than peer or social comparisons (Dalton, 2018). The same study indicates that social recognition and ceremonies increase project output in Nigeria, ceremonies here meaning public accolades and recognition.

1.2. Behavioral nudge and water conservation

Behavioral nudging is informed by a growing body of research in the field of behavioral economics that indicates positive reinforcement and indirect suggestions to influence the choice(s) and decision-making process of people or groups. The use of behavioral nudges can be applied nearly in every aspect of human endeavor such as politics, water conservation, energy conservation, health, among other applications. What makes behavioral nudge appealing is its ability to speak to the consciences of people without directly making those appeals in a direct way. It is not autocratic in nature; it is inexpensive in that it can be incorporated in an ongoing policy. For example, a department of motor vehicle (DMV) form that automatically include people as organ donors except they opt out. This kind of behavioral nudging is inexpensive in that you do not require different staff to implement this. Again, it is democratic, in that people have the right to opt without any prejudice.

Richard Thaler and Cass Sunstein in their book called improving Decision about Health, Wealth, and Happiness have brought the concept of nudges to the grassroots and have implicitly provided clarity between nudges and other forms of incentives like prices, and financial incentives (Cai, 2019). They stated that humans have biases, and based on this cognitive sentiments, information or choices can be willfully presented to people, and thus influence their behavior. That means, individuals can be nudged to achieve expected ends. Nudges have been used by the UK, the US, Mexico, Germany, and other advance economies to change socio and health outcomes of their populations, such as health impacts on smoking, excessive soda consumption, obesity, teens pregnancy and more (Ensaff, 2021; Rutter, 2020). At the other hand, it has been weaponized according to US intelligent agencies, and the US Democratic Party, which accused Russia of influencing the 2016 US election in favor of Donald Trump (Consell de l'Audiovisual de Catalunya, 2018).

One possible first step in this process of water conservation using behavioral nudges is providing information to people about the importance of water saving and providing requisites background information on the importance of water conservation to the population (Syme et al., 2016). Awareness in the case of water conservation have been credited

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to be impactful where available (Kagoya et al., 2018). It has been found that media information campaigns are indispensable in creating more educated or informed and rational water users (Antwi et al., 2022; Pretorius et al., 2021).

1.3. Gaps

In investigating behavioral nudges in SSA, we find that weak institutions, advanced technologies, and infrastructure were inimical to the development of water sector and by extension affect the wide accessibility of behavioral nudges. Our finding echoes the work of Union (Union, 2012). In the case of sanitation, technology can be used to modify behavior and trigger community-led change. In Kenya, the Ministry of Health has implemented an online, real-time monitoring system of maps and reports to show national progress towards the aim of communities becoming open defecation-free (ITUNews, 2018). Devolved water management systems have been found by many authors as an internationally relevant way of managing water resources, economically and technically efficient (Suriyachan et al., 2012) and possibly community driven practice that fosters urban sustainability (Chelleri et al., 2015). Thus, the issues of governance persist in SSA and may not be favorably for effective behavioral nudge implementations.

It is clear from research that different measures have been deployed to dealing with water crises in SSA, but the problem is that some of these measures have been inadequate, late, or completely inappropriate for the situation they are trying to address. For example, the use of awareness to educate farmers about the water issues is well established process in SSA (Mango et al., 2017). While awareness has been credited to be a program of choice when tackling water conservation in the region, it has equally been stated that farmers education level, extension services, access to capital, policy incoherencies, and corruption were all instrumental to the failure of the exercise (Abdulai & Huffman, 2014; Partey et al., 2018). Abdulai & Huffman, (2014) made another important observation in this regard, that technology is important cornerstone for behavioral nudge application. And because these technologies are too expensive or requires advance knowledge which may be unattainable in the region, this can undermine water conservation efforts and behavioral nudge implementation. To address some of these gaps in the literature, we intend to provide conceptual framework in order to determine effectiveness of behavioral nudges of advanced countries such as the United States, United Kingdom, Germany and others, and present those mechanisms that address their water crises more efficiently and at the same time compare them with SSA and underscores why it seems to be futile in addressing the same or similar water problem in SSA.

2. Conceptual framework

Behavioral nudge is not yet a widespread policy instrument in developing countries and Sub-Saharan Africa in particular, therefore it will be difficult to aggregate a meaningful dataset. Conceptual framework becomes a veritable tool for this work because it is going to provide clear understanding of those factors that enable behavioral nudges to thrive in the west and why its development in SSA is still nascent.

Water scarcity is not just a function of increased population, skilled-manpower, income, and other related resources that are needed to develop, allocate, adjudicate, store, measure, recycle, remove, convey, conserve, and purify water but also the health of institutions that govern and manage it (Tariq et al., 2016; Yang & Zehnder, 2002). Good institutions, good governance and good leadership are considered by many authors as necessary conditions to support the development effort of a country or region (Talmaciu, 2014). It has been established that the health of institutions is positively related with how policies are enacted and accepted in that country. Policies such as property rights, entry and exit barriers in business, contract enforcements give you a fore taste of a country's general wellbeing. For example, the United States and North Korea will enforce afore mentioned rights differently. Therefore, behavioral nudges for instance will be unworkable in

countries like North Korea, and some SSA countries because of the ways in which their institutions are set up compare to the United States and other industrialized world (Samarasinghe, 2019; Tariq et al., 2016).

Our conceptual framework frames the effectiveness of behavioral nudges as a function of workable institutions and governance, educational attainment of the population, access to infrastructure and technology, and ultimately the effects of multiple ethnicities and languages. We are going to use these variables that have worked in most places in the west where behavioral nudges have been applied and ask the question why it is problematic to measure the similar results in SSA. This is going to be evaluated in the conceptual framework section of this work.

Table 1. The conceptual framework of behavioral nudges.

Multiple Ethnicities and Lack of Common Languages	(Aluko, 2003; Fessha, 2016)
Limited access to Technology	(Asongu & Odhiambo, 2020; FAO, 2007)
Limited Infrastructure	(Dionysious, 2018; Ribeiro & Rodriguez, 2020)
Weak or Absent Governance	(Bassey & Udoudom, 2018; Mosweu & Rakemane, 2020)
Limited Educational Attainment	(Fredriksen & Fossberg, 2014; Wakefield et al., 2010)
Weak or Absent Institutions	(Talmaciu, 2014; Worldbank, 1996)

The regional development in EU nations is strongly institutionalized and established by politics, strategies, and policies. In this context, factors such as institutional framework, regional/local leadership and quality of regional/local governance can play an important role in supporting the efforts of citizens towards economic and social development and to mitigate the significant gap that separates the lagging regions to those that are industrialized (Talmaciu, 2014). Economic principles that can inform water conservation policy debate rest on the concepts of effective institutions. For example, how can a country that do not have a refusal disposal management system encourage its citizens not to litter the cities where they have not provided means by which its population can adhere to their demand. The same can be said of water conservation in SSA, there is no plan, policies, and institutions that enact policies that help citizens conserve water with meaningful results. Water conservation is only possible when people have the means, understanding and the technology available to actualize it.

2.1. Behavioral nudges in the context of SSA

There are few examples where behavioral nudges have worked in SSA, the use of behavioral nudges for water conservation in Sub-Saharan Africa is not popular. However, just like social media, these methods are beginning to gain tractions though this traction is being gained in a few relatively better off countries like South Africa and Nigeria. For example, one study in Cape Town South Africa describes how behavioral nudges were deployed for the purpose of water conservation. The Cape Town study was effective in reducing water consumption, which is particularly relevant because Cape Town bears the burden of problems of both a water crisis and extreme income inequality. Ultimately, the behavioral nudges were found to have a significant effect on water saving: resulting in an average reduction of water usage of between 0.6%-1.3% across the various treatments (Brick et al., 2018).

The potentials of behavioral nudges were put to the test in Nigeria to see if it can help sustain crowd contributions (this is where individuals provide information on food prices, where everyone who needs them can access it) by leveraging intrinsic and/or extrinsic incentives. They used two randomized control trials (RCTs) to gauge whether the inclusion of two nudges (one based on social norms, and another based on information disclosure) in the design of a food price crowdsourcing initiative can improve crowd participation. And the findings show that social norms (reference group especially groups that one values and respects) increase crowd involvement while disclosing price information does not (Solano-Hermosilla et al., 2022). {Despite these challenges, the issues remain as pointed out by the introducing conceptual framework.

2.2. Possible Challenges of Implementing Nudges in Sub-Saharan Africa

Water conservation and the use of behavioral nudges in SSA have been constrained by many factors such as property rights, multiple ethnic groups, multiple languages, and lack of infrastructure (Coulibaly et al., 2018). Behavioral nudges do not work in a void, they need systems, effective institutions, and infrastructure to work. And SSA for the most part lack these, which can hinder smooth operation of this theory. From table 1 above, we have concepts that we need to explain for the purpose of this work.

2.2.1. Weak or Absent Institutions

Institutions are a part of the social structure of a society that define the way we interrelate with one another within a community. They are framed by the values and cultures of that society and provide order and stability therein. What is the importance of institutions in our society? Institutions bring stability, particularly during the times of uncertainty, and help steady expectations. During political uncertainty, effective institutions are important since they can deliver their roles conclusively and outside of the red tapes of political process (ECB, 2019). Example of institutions are courts, economic sector, education sector, religious institution, government institution, etc.

The institutional crisis affecting economic administration in Sub-Saharan Africa (SSA) is a crisis of structural disconnect between formal institutions occasioned by mixtures of different ideas -from outside and indigenous institutions born of the culture and traditional values of the African past (Worldbank, 1996). There is increasing emphasis on the role of institution on economic development recently. The dominant message is that institutions which form the incentive of economic performance. In the west institutions such post office, department of motor vehicle (DMV), utility companies, and labor department are used every often to pass nudging messages either to save more water or electricity, or to opt in pension scheme, or organ donor. The contrast is the case in SSA where there are relatively weak institutions, riddled with corruption and half-trained labor force.

2.2.2. Weak or Absent Governance

Governance is the processes that operate the institutions. For example, policies that are enacted to make the institution function as it should, Governance includes framework by which a society is managed and run, and the apparatuses by which it, and its people, are held to account such as ethics, compliance and administration are all essentials of governance (Governance Institute of Australia, 2022). A practical example of governance would be the mayor's decision to decrease the police force in response to crimes reduction.

Another crucial reason why behavioral nudges may be problematic is lack of democratic principles in the region, knowing that one cardinal principles of nudge are freedom of choice. And finally, trust. People's trust has been eroded due to corrupt and insincere officials in governments. So, it will take herculean efforts to changes minds that have been constantly deceived in the past. Mosweu & Rakemane, (2020) emphasized the relevance of good governance. Africa is a continent which has largely been riddled with poor governance- lack of accountability, transparency, and the rule of law. Poor records

management practices encourage bad economic practices such as corruption and fraud (Mosweu & Rakemane, 2020). Weak political and democratic framework in Sub-Sahara Africa is a key issue that can undermine the concept of behavioral nudges. Behavioral nudges thrive on democratically and freedom of choice atmosphere. Bassey & Udoudom, (2018) believe that democracy might not be suitable to Africa and one can effectively argues that in such society that nudging will be ineffective.

2.2.3. Multiple Ethnicities and Lack of Common Languages

Multiple ethnicities and languages- it is characterized by people of different cultural antecedents, religion, and often time different languages. For example, in Nigeria a country in SSA, has more than 2000 ethic grouping and languages.

There are several reasons nudge may not work in Africa, especially in Sub-Saharan Africa. One of these issues is that of multiple languages used by residents; take for example Nigeria, which has over 2000 languages and ethnic groups. The emergence of ethnic awareness is a volatile and progressively strong force in the today's global environment. It has pulled down empires, created new nations and produced a rising tide of hopes. Ethnic minorities are increasingly more confrontational and more self-aware in all nations, whatever their stage of industrial and political growth (Aluko, 2003; Fessha, 2016). Vieyra, (2019) recognizes that dubbing films or educational materials in multiple languages could be problematic, but rather suggests that having one dominant language that majority speak will be more beneficial. The problem with this suggestion especially in the case of SSA is that majority of the ethnic groupings and languages are small. Thus, it is not economically viable to invest all the time and effort in all the languages and ethnicities in SSA trying to translate one behavioral nudge program or the other.

2.2.4. Limited access to Technology

Technology is the application of scientific know how to practical objectives of human endeavors. Examples of technology is computers, and various types of machineries. In SSA the access to technology is still at its infancy, and where available it is not common or saturated among majority of the population.

Looking at the Issue of technologies, mass media penetration is at its infancy in most nations in Sub-Saharan Africa. In the last decade, numerous smart cities all over the world have started deploying internet, big data, and algorithms to nudge households and businesses to save water and energy, live healthily, utilize public transportation, and engage communal activities (Ranchordás, 2020). While this is true, the penetration in SSA is still at infancy. The study by Asongu & Odhiambo, (2020) give credence to the importance of technology in aiding implementation of growth and wellbeing and by extensions implies that policies could be hampered by inadequate access to basic technologies with adverse consequences to the GPD and economic growth. The importance of mass media in disseminating agriculture information to farmers have loaded (FAO, 2007; Hassan et al., 2010). In SSA, access to technology such radios, TV and newspapers have been lagging with implications to productivity, water conservation, and other modern agricultural interactions. Benefo & Takyi, (2002) show the importance of mass media in AIDS prevention in Ghana. The access to knowledge was instrumental in saving lives especially through mass media, this in effect is where they are available.

2.2.5. Limited Infrastructure

Infrastructure is the set of essential facilities and systems that support the sustainable functionality of households and firms. Examples are buildings, roads, power supplies, and ports required for the operation of a society or economy.

Another important factor that could prevent the effective implementation of behavioral nudges in Africa is inadequate infrastructure. In most Africa countries, access to basic infrastructure similar to that found in the west is non-existent. There are constant

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electricity outages, and low speed internet. The inherent costs of providing this infrastructure are prohibitive with corresponding consequences on food and water security. Most of the projects and equipment cannot be operated without electricity, Artificial Intelligent (AI), and internet. Thus, it becomes problematic to provide any effective nudge to a majority of the population due to lack of access to these amenities. (Dionysious, 2018) echoes the sentiment opined above with the same zeal. Added to non-ubiquitous availability of ICTs' tech, the knowledge gap that exist on their usage, research gaps, and lack of collaboration with scientific organizations are some of the problems that hampers this objective (Ribeiro & Rodriguez, 2020).

2.2.6. Limited Educational Attainment

Education entails the number of people that can read and write, that have technical ability work on different crucial society needs such as water and energy projects so on. Most people in Sub-Sahara Africa still live-in rural areas where basic education, and other life enhancing framework are lacking. There are other studies that reinforce the importance of access to information or education in Africa, but frown that rising population and decrease in investment in education have set the continent backward (Fredriksen & Fossberg, 2014).

Education is not just classroom buildings, but encompasses mass media, which is lacking too. A study by Bekalu et al., 2014; Wakefield et al., (2010) reinforced that a lot can be done and achieved where education is available, be it via mass media or classroom setting. It was gathered that where mass media was available that the spread of HIV was weakened, and the opposite is the case in the rural areas and where mass media was not available. This study essentially used mass media to educate citizens about the impacts of HIV and AIDS, and the implication is that this important medium of communication was impactful in nudging people about the scourge of AIDS. However, due to limited saturation of mass media in Sub-Sahara Africa and this could limit the benefits either to HIV and AIDS, water, open defecation, smoking, and water conservation (Bekalu et al., 2014; Wakefield et al., 2010). The educational enrolment in SSA is grossly underrepresented. SSA represents 11 per cent of the world population (720 million) have only 3 per cent (4.5million) of their population in higher education (Akinola & Bokana, 2018). This ratio barely stands a chance in comparison to the high-income countries 70 per cent. From the 3 per cent (4.5million), Nigeria has 1.5 million and South Africa 0.7 million. The situation is worse in some countries like Tanzania, Chad, Malawi, Central Africa Republic and Niger, the enrolment in higher education is between 2 percent and even lower in 2010 (Bloom et al., 2014). Somalia, Congo, Angola have even more grim situation (Tilak, 2011).

Table 2. Possible benchmarks to be met prior to the implementation of behavioral nudges.

Improved education enrolment	75 and above per cent enrolment
Governance	Corruption ranking of 60 and above
Technology	Computers ownership per capita
Infrastructure	At least 70 per cent of the citizens
Education	Increase in literacy at least by 70 per cent
Multiple ethnicities and languages	Able to use pictorial images

The values in table 2 were derived from multitude of sources or datasets where most of the SSA ranked below average (Azzarri & Signorelli, 2020). According to transparency international most African countries ranks poorly with corruption and on average those countries that ranked 35 with score of 60 and above their corruption tend to be manageable (CPI, 2020; Mosweu & Rakemane, 2020)The same goes with education, infrastructure, SSA ranks at the bottom or below other continents.

3. Discussion and Conclusion

Water conservation has been growing momentum throughout the world and Sub-Saharan Africa (SSA) in particularly. This is partly due to climate variability, drought, population growth, and the growth of middle class. Considering these challenges, efforts have been geared towards reducing water consumption through different conservation mechanisms such as mulching, drip irrigation, deserts adaptive crops, etc. In the case of SSA, applying holistic water conservation techniques may not be ideal due to the region idiosyncrasies- income level (majority of people are poor), subsistence farming system, government inertia, and technical prowess of the people among other challenges.

A behavioral nudge is defined as positive reinforcement and indirect suggestions as ways to influence the behavior and decision-making of groups or individuals. First, we examine the potential for behavioral nudges to be used as veritable tool to address water challenges in SSA for the following reasons: they are easy and cheap to apply and implement, it is egalitarian- participants can easily opt in or out i.e., freedom of choice.

Our conceptual framework has been used to dichotomize factors that are responsible for the imbalances in behavioral nudges penetrations in SSA. What we found was that poor governance, inadequate access to technology, infrastructure, education, institution, and multiple ethnicity and languages were instrumental for SSA lagging in adoption of behavioral nudge principles. Some of the possible benchmarks that are likely to be met to make the implementation of behavioral nudges in SSA possible can be seen in table 2 above.

The use of behavioral nudges has started gaining traction globally in the last couple of years. This is because of non-invasive nature of behavioral nudges and its ability not to infringe on people's freedom. Countries especially the United States, the United Kingdom, and others have employed this concept. In SSA however, it is gaining traction too albeit with gradual steps. This is particularly the case in the two most dominant economies in the continent- South Africa and Nigeria. The overarching finding why behavioral nudges may not work effectively in the SSA are such things as low ICTs and other infrastructural penetrations, knowledge gaps, multiple languages, and ethnic groups. We believe that these findings and suggestions can spur research in areas of compactible conservation techniques that could be deployed in SSA.

3.1. Way forward

There is no reasons behavioral nudges will not be beneficial to SSA if the favorable atmosphere as have been extensively discussed in the conceptual framework section were to be implemented. Such atmospheres as good governance and institutions, attainment of basic education by the citizens. Nigeria alone has more than 10 million kids who are out of schools (Antoninis, 2014), these are kids without basic elementary school attainment. Access to basic amenities is another hurdle that needs to be addressed as noted earlier. The twin issues of multiple ethnicities and languages could be problematic to the rapid implementation of behavioral nudges. This is concerning as nationalist tendencies have been growing across the world, and people tend to stick their guns towards things that favors their interest and choices.

In our opinion, behavioral nudges can be cost effective in addressing many societal issues such as managing droughts, water scarcity, and numerous other issues confronting the subcontinent. This is particularly the case, considering the fact that it costs little or nothing to apply this concept. Essentially all that is needed is efficient and effective institutions, governance, and other ingredients that make for good running of a society. We do not claim that behavioral nudging has a magic bullet to solving all the water crisis in SSA. Rather a combination of good governance and institutions, access to infrastructure and education attainment, and lowering of ethnic tension could help the implementation of behavioral nudges in SSA. There is no single way of achieving complete water management, but behavioral nudging is another veritable tool in tackling water challenges considering SSA idiosyncrasies- poverty, geography, infrastructures deficits and educational levels among others.

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