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REVIEW PAPER



Public participation on waste management between nature reserves and surrounding informal settlement: A review

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ABSTRACT

Human land use has begun exerting pressure on global ecosystems, causing a decline in biodiversity, and putting pressure on the biosphere's ability to support life. Migration and rapid population growth in urban areas have resulted in a growing volume of solid waste in nature reserves due to littering and illegal dumping. The existence of illegal dumping and littering continues to be a worldwide problem, even in protected areas. With the rise of informal settlements nationwide that contributes to illegal dumping and littering in developing nations undermines any effort to address the challenges of service delivery and creates unexpected environmental impacts. Even though there are numerous challenges to protected areas everywhere, urban proximity to protected areas exacerbates the threat level. This review aims to show the significance of human interaction with natural areas through community engagement, acknowledgment of traditional knowledge, and co-existence between conservationists and local communities. These in essence advocate for environmental sociology. The paper made use of a systematic literature review to critically analyze the topic and observe the trends. The literature reveals that thousands of protected areas are already impacted by urban areas.

Implications: The study sheds light on future urban development and pollution control. Our communities' environmental and social conditions are influenced by major urban areas, suburbs, and informal settlements. This is the first study to examine the urban sprawl of informal settlements that intrude on nearby natural areas. For decades, nature reserves have played an important role in conserving biodiversity. Littering and illegal dumping have increased the amount of solid waste in the metropolitan nature reserve as a result of rapid urban sprawl. The division of large natural areas into smaller spatial units can hinder the migration of species. By interspersing undeveloped and developed areas, leapfrog development patterns further divide natural landscapes. Long-term sustainability depends on understanding the causes, effects, and policy implications of sprawl.

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Introduction

Migration and rapid population growth in urban areas have resulted in urban sprawl which then translated to a high volume of solid waste around nature reserves due to littering and illegal dumping (Belsoy, Korir, and Yego 2012; Cieslewicz 2002; McKay and Tantoh 2021; Peck 1998). Reasonable waste management is a global necessity that significantly contributes to environmental protection. Even though numerous types of threats exist at all distances in protected areas such as Wolfgat nature reserve, urban proximity heightens the threat level. Several studies have emphasized the significance of public participation in waste management which strengthens environmental sociology, whereas others have demonstrated and argued that public participation is not necessary for the success of these protected areas (Brockington 2016). As a result of losing land and

resources to conservation authorities, several communities have been displaced and experienced a rise in poverty (Roos et al. 2021). Despite the history between conservation authorities and local communities, human interaction cannot be avoided due to the burgeoning population. Human interactions between urban areas and protected areas increase with the distance between them, resulting in new negative outcomes, including improper waste disposal (Claassens et al. 2022; McDonald et al. 2009). As the effects of human activities on global biodiversity increase, pressure increases within and around protected areas. The growing influence of humans on ecosystem functions has made waste mismanagement a concern for decades.

Several studies have demonstrated that protected areas give rise to social and economic conflicts and that the majority of these conflicts arise when locals are excluded from decision-making in these areas

(Bennett et al. 2019; García-Frapolli et al. 2009, 2018; McKay and Tanto 2021). A study which was carried out by Krinsky and Simonet (2017) revealed that visitors and neighbors play a vital role in protecting parks, and that treating nearby communities as residents and visitors, as opposed to intruders, has a positive effect on how individuals behave in these areas. However, in South Africa, protected areas are still viewed as isolated structures governed by either private or state systems, and there is less human interaction between protected areas and people living outside of nature reserves. Nonetheless, attempts to preserve nature have been based on a western scientific philosophy of separating it from human lifestyles, and regrettably, this approach is still widely used. In the case of South African nature reserves, local communities adjacent to the nature reserves illegally dump their waste in protected areas, as these areas are frequently viewed as open spaces that harbor criminals due to their dense vegetation (McDonald et al. 2009). This is most prevalent in areas with no sustainable waste collection services, such as informal settlements.

It has been established that thousands of protected areas are negatively impacted by urban areas growing population and inadequate sanitation in human settlements and that many more protected areas will be in the future (Doxa et al. 2017; McDonald et al. 2009). In addition, environmental and socially responsible waste management practices in protected areas are essential. However, there is limited published research on waste-related impact in protected areas and few studies on waste management in protected areas as a whole, particularly in South Africa. This review aims to shed light on the significance of human interaction with natural areas through community engagement emphasize the importance of traditional knowledge, and demonstrate behavior changes when nature is promoted for and by humans rather than protected from them. The key question is how humans and the natural environment can coexist by aligning the needs of neighboring communities with the protected area.

Literature review methods

The current study carried out a systematic literature review aiming at holistically exploring the concept of public participation on waste management between nature reserves and surrounding informal settlement. Subsequently, papers were selected to inform the review by extensively searching the range of multiple Scientific databases such as Google Scholar, Semantic scholar, Web of Science, Sage, and ResearchGate. In these databases, thematic search terms such as (1) Conservation,

traditional knowledge, and Indigenous people (2) Decolonising Conservation Policy (3) Littering in protected areas, a conservation and management challenge (4) Urban protected areas (5) Environmental performance of tourism accommodations in the protected areas, just to mention a few. These concepts were used to narrow down the search within the relevant scope on how communities adjacent to protected areas can be included as crucial stakeholders in decision-making and in tackling illegal dumping and littering. Furthermore, these themes were designated to capture a broad range of academic papers within the concept of public participation on waste management between nature reserves and surrounding informal settlement thus circumventing comprehensively capturing all studies that may not be directly related to the current concept. While the current study anticipated that there will be studies outside these search terms that may reveal pertinent information about public participation on waste management the usage of specific search terms such as “waste management” without making mention of “public participation” were carefully eliminated as a means of a control procedure. This exercise was undertaken to maximize the quality outcome of the review. However, to access several relevant articles and reports related to the topic a second search was conducted. This second search incorporated the use of snowball methodology from the appropriate list of references generated in the first search. Limitations of the literature search methods included the search of related academic papers written in English.

Public participation (people-centered approach)

Researchers have demonstrated that initiatives in more developed nations often do benefit biodiversity in locally managed areas (Dube 2018; Popova 2014); in situations with well-educated and prosperous people, citizen science emerges, and people frequently self-organize to support biodiversity conservation efforts. Multiple authors have argued that the naive conception of a community as a homogeneous group with a shared vision of conservation is false (Agrawal and Gibson 1999; Queiros 2022; Xu et al. 2022). However, a study reveals that communities can be a homogenous group with a shared vision when they are involved in public intervention (Andrade and Rhodes 2012), such as increasing participation in waste management program decision-making and making the local communities the guardians of those areas. Researchers suggest that public campaigns should emphasize residents' responsibility for their waste and the importance of each citizen's cooperation, fostering a sense of a shared

community goal for addressing waste issues (Daniel 2018; McAllister 2015). Thus, the United Nations prioritizes bringing communities close to protected areas through the sharing of ecological resources and ensuring that protected area plans consider communities (Buys 2020).

The issue of public acceptance, changing value systems, public participation in the planning and implementation phases, and changes in waste behavior are as crucial as the technical and economic aspects (Chang and Pires 2015). In their study of Serengeti National Park and the Ololosokwan communities, Burgoyne and Mearns (2017) found that building trust between conservation areas, communities, and other stakeholders takes a long time, and conflict persists. Due to the different needs, goals, agendas, and perceptions of the issues among stakeholders, it becomes difficult to include all parties in decision-making. Participation and empowerment of the public, transparency of decision-making, networking, cooperation, and collective action, as well as communication and availability of information, are therefore crucial to the success of these integrated programs (Marshall and Farahbakhsh 2013). Effective waste management must be fully embraced by local authorities and the public sphere, and the entire waste management decision-making process must involve all stakeholders.

People and conservation (modern conservation)

The establishment of nature reserves through the establishment of protected areas has a complicated history in the ecosystems and communities of Southern Africa. The colonial authorities established protected areas in accordance with the western model of conservation to control and exploit hunting revenues while displacing indigenous people from their ancestral lands (Noe and Mwamfupe 2021). Several studies have demonstrated that the history surrounding the creation of the majority of protected areas can influence how communities perceive and feel about them (Brockington 2016; Simpson and Newsome 2017) most particular in the African continent, as literature has shown that often than not it was forceful removal from their land (Omoding et al. 2020; Tessema et al. 2010). In some cases, studies indicate that the forcible removal of indigenous people from the protected areas in the past may have contributed to social, economic, and political tension (Mutanga et al. 2015). In many cases, communities (especially elders) may harbor deeply rooted memories that influence their perception of protected areas and their relationship to them (Dube 2018), resulting in resentment of protected areas.

Several studies have suggested that, in order to correct past errors, a broader range of issues and their root causes must be considered to improve nature conservation outcomes (Buscher and Fletcher 2020; Domínguez and Luoma 2020; Dube 2018; Rice, Sowman, and Bavinck 2020). It has been demonstrated, however, by Thondhlana and Cundill (2017) that despite efforts to rectify past injustices, local communities use natural resources within the protected areas irrationally and destructively, leading to biodiversity loss and degradation. Consequently, policies and law enforcement are regarded as crucial when interacting with local communities due to the lack of formal relationship and respect between the conservators and the local communities. In South Africa, law enforcement is still the primary tool for dealing with neighboring communities (Mashele, Thompson, and Downs 2021; Massé 2020). Government structures are primarily to blame in such instances of exclusion because they have failed to exercise adequate stewardship over resources and to ensure that all stakeholders' values are adequately protected (Buys 2020; Thondhlana and Cundill 2017).

History teaches us that separating people from their ancestral lands removes one of the most effective protections these territories could ever enjoy (McDonald et al. 2009). It has also been shown by several studies, in support of the claim cited above, that indigenous communities and communities have been conserving their traditional territories for centuries before European contact labeled them barbaric and threatening to flora and fauna (Armitage et al. 2020; Roos et al. 2021; Sanderson, Walston, and Robinson 2018). However, conservation in southern Africa is still heavily influenced by colonial practices, both historically and currently. Europeans colonized not only humans but also nature (Mbaria and Ogada 2016). When protected areas operate directly against the economic interests of local communities, this has in the past led to conflict, causing people, particularly in developing countries in Africa, to oppose conservation efforts (Sayer, Margules, and Boedhihartono 2017). Therefore, if these techniques of excluding certain groups continue, the long-term goals of protected areas will be jeopardized, and the conservation success will be temporary.

Conservation by, for, and to local people

Local communities are effective conservationists, according to research; indigenous people are the best conservationists and most effective climate change mitigation in the world (KC, Ghimire, and Dhakal 2021). Literature has indicated that stricter regulation and law enforcement do not necessarily result in better

conservation outcomes, whereas protected areas that improve human well-being by permitting sustainable use of the resource base are correlated with better conservation outcomes (Armitage et al. 2020; Domínguez and Luoma 2020; Oldekop et al. 2016; Ward, Stringer, and Holmes 2018). Due to individual differences, some local communities will inevitably be more concerned with immediate values that they can derive from these areas and less concerned with values such as biodiversity conservation when they are involved (Thondhlana and Cundill 2017). For biodiversity to be valued, it is essential that these areas provide people with the resources, education, and recreational opportunities they require. Popova (2014) demonstrates that the assumption that local people will protect biodiversity and not pose a threat to it is false. There are numerous studies on the efficacy of local management in providing economic benefits to local communities (Sayer, Margules, and Boedhihartono 2017). Therefore, this mitigates threats to the protected areas as the benefits are shared amongst the communities rather than the elite outsiders. It would be unwise to assume that global environmental values will be a priority in poor countries where people are struggling for survival, as stated in a paper by (Dawson et al. 2021). For conservation projects to be successful, it is required that they correspond to the social, economic, and political contexts of the communities they serve, utilizing local labor and creating jobs for the people.

Multiple global studies have demonstrated that protecting biodiversity at the expense of local communities is inappropriate (Fanari 2019; Forje, Tchamba, and Eno-Nku 2021). The Asia-Latin America study demonstrated that wildfires are contained more effectively in indigenous and community-managed protected areas with multiple uses than in strictly protected areas (Tauli-Corpuz et al. 2020). Therefore, local management should not be centered on the protected area's benefits but it should also empower people with decision-making rights. However, it should be a matter of safeguarding a region of vital importance. It is argued that conservationists will lose what they value most if the principle of local support is not taken seriously (Buscher and Fletcher 2020; Thondhlana et al. 2020). Without broader support, especially from surrounding rural communities, the future of many protected areas in developing countries is bleak (Noe and Mwamfupe 2021). Thondhlana and Cundill (2017) investigated the perspectives of reserve managers and local communities regarding their relationships and the existence and root causes of conflict. A study conducted at the Dwesa-Cwebe nature reserve in the Eastern Cape by Bango and Xelelo (2017), revealed stark differences between the perspectives of reserve managers and local

communities. Reserve managers generally believe that there are no conflicts with local communities, whereas several studies have shown that local communities cite restricted access to protected areas, a lack of benefits, disrespectful behavior of park rangers, and lack of communication are the main sources of conflict (Andrade and Rhodes 2012; Bango and Xelelo 2017; Soliku and Schraml 2018).

Human interaction, societies, and systems are complex, so it is difficult to explain why it is essential to preserve ecosystems and conserve them for future generations when people are struggling to feed their families and compete for living space. To improve their health and well-being, it is crucial that communities share in the ecosystem services that conservation areas provide. Providing economic opportunities for the community will not only help address some of these maintenance issues, but can also provide psychological benefits (Buys 2020; Roos et al. 2021). The majority of studies showing positive outcomes in both well-being and conservation occur when local communities play a central role (Dudley et al. 2018; Jax et al. 2018; Khalid et al. 2019). For example, when local institutions are recognized as part of governance, or when they have institutional influence over decision-making, they are more likely to have positive outcomes for both well-being and conservation. In contrast, interventions governed by external organizations and involving strategies to alter local practices and replace traditional institutions tend to result in relatively ineffective conservation and negative social outcomes (Dawson et al. 2021)

Waste in protected areas

Responsible waste management in protected areas is essential to ensuring that the areas remain protected and that negative impacts on the visitor experience are minimized, as these areas are of high value due to the presence of numerous irreplaceable natural resources (Plumptre et al. 2019). Consequently, it is essential to implement sustainable development in these regions by conserving natural resources. Ineffective waste management in areas adjacent to protected areas is a particular concern associated with increased development near natural areas. Government is responsible for the waste management and funding of waste management measures in state-owned protected areas (IUCN 2021). With informal settlements built directly on the fences or boundaries of these natural areas, these areas become susceptible to the dumping of waste, which occurs because of the apathetic conditions that characterize them and lack sufficient waste facilities (Matebese 2019). The production and mismanagement of waste

can lead to pollution, environmental degradation, and negative socioeconomic impacts, such as land degradation, resource depletion, surface and groundwater pollution, loss of biodiversity, and an impact on the aesthetic value of these areas (Roos et al. 2021).

A consequence of excessive population growth, according to Matebese (2019), is that informal structures are no longer a rarity in our cities; instead, they have become a permanent feature. The increase in municipal solid waste is typically attributed to rapid urbanization, population expansion, and unrestrained modernization (Abegaz, Molla, and Ali 2021). Despite this, it has been found that people's behavior, willingness to implement waste management measures, and local support play a significant role in the establishment and implementation of responsible waste management measures. The implementation of sustainable solid waste management in protected areas may be enhanced by exploring waste-related opportunities (Claassens et al. 2022). As a result of community development, conservation efforts may be increased as well as pollution prevention efforts (Roos et al. 2021). Waste management is a global necessity that can significantly contribute to environmental protection, but the rise of informal settlements in developing nations undermines any effort to address the challenges of service delivery (Mporetji 2008). According to Hong and Chan (2010), the largest threat to Penang National Park is solid waste mismanagement. In the South African rural communities and protected areas, waste mismanagement is not new. Chang and Pires (2015) argue that waste can be mitigated or entirely eliminated through sustainable solid waste management. Due to the fact that waste management is a problem worldwide and in South African cities, it is highly probable that waste problems will also exist in protected areas that are guided by several laws (Claassens et al. 2022). According to the World Bank's Urban Development (2022), the amount of solid waste will increase from the current 1.3 billion tonnes per year to 2.2 billion tonnes per year by 2050 in developing countries, which are already dealing with growing populations, limited financial resources, and limited capacity to manage environmental issues.

The table below lists some protected places that are negatively affected by urban sprawl, informal settlement, or unlawful dumping; regrettably, some are negatively affected by both.

Table 1 is an illustration of protected areas affected by illegal dumping

The impact of protected areas on the livelihood of the rural poor

The most disturbing of these studies on conservation and local communities conducted in Africa, is that the creation of protected areas led to local communities' apathy and poverty (Giampiccoli and Glassom 2021). The proportion of land devoted to protected areas in Africa remains one of the highest in the world. However, the western approach to conservation has frequently had a negative effect on people's way of life through forced displacement and denial of access to essential human needs. Consequently, protected areas have frequently led to an increase in poverty among the poorest of the poor. The poverty debate must acknowledge that the cost of protected areas is frequently borne by the poor (Fanari 2019; McShane 2003; Ward, Stringer, and Holmes 2018) through being forced into new ways of living such as restricted use of resources within the protected areas. In practice, this means that we must strike a balance between the requirement of no net loss of biodiversity and the requirement of no net negative impact on livelihood within protected areas, or at the very least cause no harm.

Studies have shown that local support is not necessary to ensure the survival of protected areas; conservation can be imposed despite local opposition, and protected areas can thrive despite opposition (Brockington 2004). As Brockington and Wilkie (2015) point out, rural poverty and injustice do not threaten conservation. Because of the preceding statement, rural populations living near areas with high biodiversity are not fully encouraged and supported to value these areas. According to this argument, the poor cannot oppose conservation because they have no rights when it comes to those areas, however, ignoring local communities could endanger protected areas in the long run. Considering that communities are expanding daily, failing to recognize their significance will result in conflict and land degradation. According to several studies, it is crucial to gain the support of locals and implement more radical measures of community empowerment in conservation

Table 1. Protected areas that are negatively affected by urban sprawl, informal settlement and unlawful dumping.

Name of protected areas	Impact of waste mismanagement	Citation or reference
Penang National Park	Water catchment areas, flora destruction	Hong and Chan (2010)
Ojcow National Park	Recreational activities, aesthetic value	Jakiel et al. (2019)
Hluhluwe Game Reserve and Sodwaba Bay National Park	Leachate	Hatton (2002)
Umtiza Nature Reserve	Water, soil, and water pollution	Chaput (2018)

(Mabele, Krauss, and Kiwango 2022; McShane 2003). Although, some people believe that protected areas have improved their lives and protected their rights to land and precious natural resources, which they could otherwise lose to stronger organizations or governments (Brockington and Wilkie 2015).

The relationship between protected areas and surrounding communities

Multiple studies have demonstrated that interactions between Nature Reserve management and local people are difficult to establish and difficult to maintain (Angwenyi, Potgieter, and Gambiza 2021; Eksteen 2012). Therefore, the depth of the relationship is unimportant so long as it benefits both the Nature Reserve administration and the community (Eksteen 2012). It is difficult for Nature Reserve management to strike a balance between social requirements and conservation needs, yet there are numerous instances when this balance has been achieved. A positive relationship with the community improves conservation. On the other side, the attitudes and actions of staff members who manage protected areas are crucial for promoting and ensuring community participation and biodiversity conservation, respectively. In other words, if the protected area personnel do not respect and value the traditional knowledge of the local people, the local communities can directly or indirectly refuse to cooperate with the protected area authority. Mutanga et al. (2015) define a relationship as the interdependent interaction between two or more persons. Consequently, each stakeholder must be regarded with equal importance and be an active participant. An important element of the worldwide conservation environment is the personnel of protected areas. To ensure balanced conservation from the viewpoints of both protected areas and local communities, it is essential to comprehend their points of view (Mutanga et al. 2015). According to Andrade and Rhodes (2012), the effectiveness of protected areas depends on the ability of managers to increase local communities' adherence to protected area conservation methods. The interaction between protected area administration and neighboring communities is largely based on the attitude of the communities and staff, but primarily on the managers. Some research indicated that reserve managers should view communities as active collaborators in the management of protected areas to achieve sustainable conservation goals (Andrade and Rhodes 2012; Angwenyi, Potgieter, and Gambiza 2021; Graham and Ernstson 2012).

The Table 2 below highlights the studies that looked at the waste management practices in conjunction with

public participation. Furthermore, the table shows that majority of the studies are on waste management in urban areas and public participation.

Discussion

Demographic changes in urban areas such as Cape Town have an effect on protected areas. In this review paper, a greater emphasis was placed on urban areas near protected areas, and it was stated that for effective waste management, all relevant stakeholders must be included in the technical and operational process in order to gain public acceptance. The problems of biodiversity loss faced decades ago are still a major concern, even though areas of high biodiversity have been converted into what is now known as protected areas. This demonstrates that past errors must be rectified, and exclusion of the public from decision-making does not do these areas justice. Therefore, combined knowledge and management would be of great benefit to all affected parties, particularly now, with the disproportional increase of urban solid waste generation in urban areas and nature-protected areas.

Government is responsible for the waste management and funding of waste management measures in state-owned protected areas (IUCN 2021). Ineffective waste management in areas adjacent to protected areas is a particular concern associated with increased development near natural areas. There are several studies focusing on public participation, urban development and impact of tourism on protected areas (see Table 2), however, the proximity of urban areas to protected areas does not in itself cause problems within protected areas, but proximity is correlated with a set of impacts such as waste mismanagement and there are no single readymade solution to control those problems that involve the use of public participation. Although visitors and people of the local community are permitted in selected protected areas, these regions frequently face environmental issues. Illegal dumping is a widespread issue in natural protected areas (Jakiel et al. 2019), behavior or lack of knowledge seems to be the key point on why they continue to litter in these regions (Sewak et al. 2021). However, the problem of concern to this paper draws from a gap of existing literature on the impact public participation has on these natural areas and as it have been supported by Birhanu and Berisa (2015) that Community-based waste management (CBWM) projects require institutional support and recognition in order to be successful. However, a major body of knowledge is on waste management in urban areas, tourist impacts on natural areas and little literature on public participation in protected

Table 2. Studies with similarly focuses looking at waste management, urban settlements, and natural areas of interest.

Author(s)	Purpose	Study area (s)	Findings
Raghu and Rodrigues (2020)	To examine the existing literature on behavioural approaches applied to the study of solid waste	Numerous geographical regions	Results revealed that most Solid Waste Management Board studies were conducted in high-income countries
Tadesse, Tefera, and Kidane (2022)	This study emphasized to trace socially acceptable and environmentally friendly solid waste dumpsite for the north eastern arid cities of Ethiopia	Semra-Logia town	Identifying suitable landfills using GIS may not be accepted by the local communities and decision-makers. The issue of selecting an optimal site for dumpsite is depended on the socio-spatial data.
Sobczyk, Biedrawa-Kozik, and Kowalska (2012)	To investigate the threats to areas of natural interest	Tatra National Park & Bieszczady National Park	It is advisable to develop. positive behaviours in inhabitants and tourists who are the users of areas. of natural interest, the educational programme should be available for all age group.
Birhanu and Berisa (2015)	Analyse current municipal solid waste management problems, opportunities and existing solidwaste management practices and role of community participation waste management practices and role of community participation	Jigjiga Town, Somali Regional State, Ethiopia	The result of the survey in the study area showed that. municipal waste is an aggregate of all substances ready for disposal. SWM is one of the important compulsory functions of not only urban local authorities but also of rural local bodies.
Dunjic, Stojanovic, and Kicosev (2017)	Sustainable waste management in protected areas of Vojvodina	nature reserves (SNR) of Vojvodina: Gornje Podunavlje, Deliblatska peščara and Zasavica	Potential of waste from tourism is great, as evidenced by examples from the world. It has already been said that the most common type of waste from tourism is packaging.
Otsuki (2016)	To show that communities' capacity to enrol the state actors in the space of deliberation is crucial to make governance genuinely inclusive.	Nairobi	The article has shown that inclusive urban government is not so much about the participation of non-state ctors such as NGOs but about the recognition of the place making process through which continual monitoring and follow up of the existing infrastructure are demanded.
Brown-Luthango and Arendse (2022)	Examines how the shifting and constantly evolving roles and practices of local government and community actors within a co-production engagement.	Malawi Kamp and Klipheuwel in Cape Town, South Africa	Illustrates the fact that local government officials do not fully understand or comprehend informal settlements and the magnitude of the difficulties they face, negotiation, decision making in the form of monthly meetings facilitated nd enabled co production and delivery of services.
Mcdonald et al. (2009)	To investigate the importance of urban effects on Protected Areas biodiversity and implications of Protected Areas and urban proximity	literature review of 163 studies identified 22 important urban effects on protected areas	As proximity between urban areas and protected areas increases, so does the potential for interactions, both positive and negative. The effect of urban areas on nearby parks is part of the broader topic of the general effect of all human land-use on protected areas DeFries et al. 2007). Here we focus on just the urban effect but recognize that other land transformations such as agricultural expansion and intensification may also have important effects. We utilize a broad definition of. Note that proximity of urban areas to protected areas does not in itself cause problems within protected areas, but proximity is correlated with a set of impacts

areas as a solution to control and minimize waste interr-ing these areas. Additionally, there is evidence that public inclusion in environmental concerns tends to lead to positive outcomes. A study by Matebese (2019) shows that excessive population growth, informal structures have become more permanent fixtures in our towns and cities, as opposed to being a rare occurrence therefore as much as there's existing literature on some potential insight into waste management in developing countries however there's insufficient literature on public participation on waste management although there has been evidence to suggest that when scientific and traditional knowledge when combined in the

management of protected areas, local communities are more likely to comply with the policies of protected areas because they feel included in the decision-making processes (Sewak et al. 2021).

Evidently, the participation of local communities in the activities of protected areas is crucial (De Pourcq et al. 2017), as it promotes law enforcement as the foundation for the success of conservation in protected areas. Nevertheless, there is a body of literature on community empowerment and involvement which shows beyond no doubt that the communities are capable of conserving their areas as long cooperative relationship is established with all stakeholders, based on

voluntary compliance rather than coercion (Andrade and Rhodes 2012; Lane 2001). But multiple variables, including household history, education, and gender, may contribute to opposite outcomes whereby people neglect their surrounding areas therefore if there is no form of interdependence between the managers of the reserve and local communities closer to it, most locals are likely to dislike the managers (Angwenyi, Potgieter, and Gambiza 2021), especially in disadvantaged areas.

The engagement of local communities in the protection of nature to improve the relationships between community members, the environment, and Nature Reserve management is globally used, however, based on literature (see Table 2) there's been a lack of showing how the public can provide meaningful impact in these areas, the environmental consequences of certain members of these communities discarding the trash in protected areas are, nevertheless, unavoidable (Buckley 2003). For many years, irresponsible waste disposal has been one of the most obvious causes of deterioration in protected areas, as it impairs the ecosystem's visual quality (de los Angeles Somarriba-Chang and Gunnarsdotter 2012; Przydatek 2019). Moreover, ineffective waste management adversely affects vital environmental and human health variables over time. According to a study by Kadafa et al. (2014) and Przydatek (2019), the increasing amount of solid trash is a big worry for many developing nations, specially protected regions. The fundamental concern is whether an integrated strategy that blends community participation with waste management strategies will reduce illegal dumping and waste production in protected areas.

Conclusion

Previous and current research provides substantial evidence that littering and unlawful dumping are not new phenomena in protected areas. The local populations' support of protected areas is important to their survival and preservation. The majority of studies examine the interaction between protected areas and local communities. However, no study examined the effect of neighboring settlements on unlawful dumping in protected areas. As they do not participate in environmental issues or co-management of protected areas, communities are typically passive players in the entire waste management chain. Findings from the reviewed literature suggest that when residents are included in the day-to-day activities of protected areas, they tend to comply with the area's rules and regulations. This study must demonstrate the local communities' responsibility as key players in the waste management of protected areas. This will

eventually determine the socioeconomic effects of nature reserves on neighboring communities. Furthermore, it was suggested that sustainable and effective conservation requires a focus on community empowerment by encouraging involvement in the affairs of the city and promoting dialogue. Not only is establishing a relationship between conservators and local communities a difficult endeavor, but the integration of rural communities and local institutions is even more difficult and expansive. It has been demonstrated, however, that people are only motivated to conserve natural resources if they receive direct material and economic benefits; therefore, to achieve effective integrated waste management, the public must be informed about the relevant areas and there must be democracy, uniformity, and centralization.

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Disclosure statement

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Data availability statement

Data sharing not applicable to this article as no dataset(s) were generated or analyzed during the current study.

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