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The Influence of Human Values on Attitudes and Behaviours towards Forest Conservation

Abstract

Human attitudes and behaviours have been linked to the degradation of global biodiversity, particularly forest ecosystems. Indeed, effective conservation actions require that the attitudes and behaviours of affected individuals and communities are taken into account. While several studies have examined how human attitudes and behaviours affect conservation, it is still unclear which, and how, human value orientations influence conservation attitudes and behaviour. This is critical because attitudes and behaviours are underpinned by the complex concept of human values. Thus, effective management and conservation of environmental resources requires an in-depth knowledge and understanding of these values, and how they affect attitudinal and behavioural preferences towards the natural environment and their protection. Here we review the human value orientations influencing people's attitudes and behaviours towards forest conservation, and discuss how conservation projects can be more successful by aligning their goals and operations to people's values. To do this, we carried out a scoping review, using the sub-Saharan Africa region as a case study, and followed the PRISMA-ScR systematic review guidelines. A narrative synthesis was adopted for data analysis. We identified different value types that fall within three broad human value orientation domains influencing forest conservation attitudes and behaviours. Anthropocentric and relational value orientations emerged as most dominant, with both positive and negative influences on a number of forest conservation attitudes and behaviours, albeit with more evidence for positive influence. The positive attitudes and behaviours were linked to utilitarian motivations and cultural beliefs and include rural support for conservation, compliance to forest rules, sustainable forest use, and participation in forest management. The values linked to dependence on forest resources, low benefits from conservation, and conservation costs, tend

to trigger negative conservation attitudes and behaviours. To effectively achieve forest conservation goals, environmental managers, conservationists, and decision-makers should understand the extent and directional influence of value orientations on conservation attitudes and behaviours.

Keywords: forest values, anthropocentric values, relational values, scoping review, sub-Saharan Africa.

1. Introduction

Forest conservation is a human problem, not least via its impacts on livelihoods (Ward et al., 2018). Its effectiveness and successes are also greatly influenced by human behaviour (Reddy et al., 2016). Forest conservation has been defined as the practice of maintaining, protecting, and/or restoring a forest landscape to conserve biological and cultural values, promote sustainable use and equitable distribution of forest goods and services, and ensure strategic preservation of forest resources for future use (International Union for Conservation of Nature [IUCN], 2008; Pawar and Rothkar, 2015). Implicit in this definition is that forest conservation has multiple goals. However, attempts to achieve these goals through conservation approaches like community forestry or the establishment of protected areas, have not always been successful (Wade et al., 2020). For instance, about one-third of global protected forest areas are undergoing various levels of degradation as a result of intense human pressure (Jones et al., 2018). In sub-Saharan Africa (SSA), a region that hosts about 25% of the world's remaining forest, and where the livelihoods and culture of millions of people are directly or indirectly dependent on the forest, human behaviours and actions have continued to play a significant role in distorting the integrity of protected forest biodiversity (Djenontin et al., 2018). This raises a critical question regarding what elements of human cognition influence people's behaviour and interactions with the conservation of natural resources, as well as knowledge gaps in terms of the geographies that have been covered by values research linked to forests.

Human values, which have been defined as motivational concerns or goals and guiding principles that influence individual or group attitudes and behaviours, are the foundational basis upon which other human cognition (orientations, attitudes, norms, intentions, and behaviour) are built (Reser & Bentrupperbäumer, 2005; Fulton et al. 1996). Human cognition depicts the diverse ways in which people perceive and think about their environment, and the ways the environment influences their perceptions and thinking (Jones et al., 2016). As the most stable form of human cognition, values underpin individual and group decisions (Cetas & Yasu, 2016). According to Ansong & Røskaft (2011), forest attitudes and behaviour are more driven by values than by sociodemographic factors. Values here, however, do not refer to the assigned monetary or financial worth of forest resources, rather they represent inherent perceptions/ideas or beliefs which people hold of the forest, forest resources, and forest conservation. They can therefore provide insight into people's diverse viewpoints regarding how they interact with and manage the natural world (Ives & Kendal, 2014).

Human value discourses in forest conservation management have often been presented as dualistic: conserving forest for nature's sake, i.e., preservation (intrinsic values), or human use i.e., utilization (instrumental or utilitarian values) (Tallis & Lubchenco, 2014; Milfont & Duckitt, 2010). Intrinsic values are non-material values and represent the human belief that a forest or forest species should exist for its own sake, independent of its use or function (Fritz-Vietta, 2016). A cluster of these values can lead to biocentric or biospheric value orientations defined as nature-centred values (De Groot and Steg, 2008). Such value orientations are therefore expected to support forest conservation practices (Batavia and Nelson, 2017). Instrumental or utilitarian values are the human belief that forests should be used to satisfy human needs or to achieve a predetermined end (Fritz-Vietta, 2016). It is this kind of value that leads to the concepts of provisioning ecosystem services like timber and firewood extraction or medicinal forest use. It is egoistic, and a cluster of these values can lead to anthropocentric

value orientations (Rickenbach et al., 2017). Although this value orientation has been criticized for tending to commodify forest resources (Rickenbach et al., 2017), divergent opinions and evidence remain regarding whether it supports or conflicts with forest conservation.

A third, more recent class of value discourse, is relational value, which has to do with preference judgment in how people relate with the natural world (Chan et al., 2016). This value type is premised on the fact that people rarely make conservation choices solely based on forests' inherent worth (intrinsic value) or on what they stand to gain from the forest (instrumental value) (Jones et al., 2016). This is because human conservation choices are also influenced by the perception of the appropriateness of one's relationship with the forest and with other forest users. A cluster of these value types can, therefore, give rise to another distinct but related value orientation, known as social altruistic values (Ives and Kendal, 2014). When social altruistic values are related to traditional ecological knowledge, practices, norms, and beliefs, as in the case of sacred forest conservation, it can lead to cultural values (Sinthumule and Mashau, 2020), which provide untapped opportunities for conservation (Cocks et al., 2012).

Several studies have examined human value-attitude-behaviour relationships under different contexts (Sugandini et al., 2017; Jones et al., 2016; Karki & Hubacek, 2015; Dietz et al. 2005; Ajzen; 1991). For example, Ajzen (1991) identified subjective norms, a form of social value, as one of the factors that determine intention to perform a particular behaviour. Dietz et al. (2005) examined values under different disciplinary perspectives and established that values are related to environmentalism. Following the recognition of the importance of human values in environmental conservation, it is therefore important to analyze and synthesize what is known about how values are influencing forest attitudes and behaviours in order to provide a more robust knowledge base that will inform forest conservation policies and programmes. This paper, therefore, aims to examine the extent of evidence and knowledge gaps in the

relationship between human values and forest conservation attitudes and behaviours, using the sub-Saharan Africa (SSA) region as a case study. Specifically, we ask: (i) what are the human value orientations influencing forest conservation attitudes and behaviour? (ii) how have human values influenced forest conservation attitudes and behaviours? and (iii) what are the geographic characteristics of forest conservation and human value evidence from SSA?

2. Methodology

We followed the established methodology for scoping reviews in the conservation and environmental literature (Peters et al., 2015; Pullin et al., 2018). A scoping review is a systematic literature review approach that seeks to map, analyze, and explain the wide range of available studies within a particular research area, thereby helping to identify relevant research gaps within a subject of study (Arksey and O'Malley, 2005). It is therefore a suitable approach to examine the extent of evidence and knowledge gaps regarding how human values influence forest conservation attitudes and behaviours.

A systematic search process was carried out using the framework for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), which requires initial development of a review protocol (see appendix). The protocol outlines the basic rationale and research questions for the review, conceptual definition of key terms (Table A1 in the appendix), literature search strategy development, data screening, and eligibility criteria, data extraction process, and quality assessment process for selected studies.

Two electronic databases relevant to environmental studies were searched, namely Web of Science and Scopus. We did not set a restriction on the earliest publication date, and all searches were conducted through to 5th November 2020. Search queries targeted three key concepts relevant to this study, (i) forest, (ii) value, and (iii) conservation, in SSA. The alternative terms

and synonyms for these key concepts were developed based on their reviews/conceptual framings in related institutional documents and extant literature (see Table A2 in the appendix).

2.1. Inclusion and Exclusion Criteria

To be included in the review, studies must have been published in English in a peer-reviewed journal. We included only original studies, so reviews, editorials, book chapters, and opinion discussions were excluded. Only studies that wholly or in part indicated a quantitative or qualitative relationship between human values (beliefs, motivational concerns/goals, perceptions) and forest conservation attitudes and behaviours were included. Quantitative studies here refer to those that used inferential statistics to determine the relationship or association between motivational concerns/goals and forest conservation attitudes and behaviours. Therefore, quantitative studies that employed a survey approach but used only descriptive statistics in analyzing and reporting their findings were excluded. Studies that used mixed-methods with descriptive analysis and qualitative analysis components were categorized as qualitative studies. However, only results from their qualitative analysis were extracted into our synthesis. Studies that examined attitudes or behaviours towards forest conservation without identifying the underlying values were excluded. We included all types of forest conservation following the IUCN (2008) guidelines for protected area management categories. These include all forms of protected forest areas such as national parks, forest reserves, community forestry including culturally protected forests, and other protected forest landscapes. Since our interest is in human values, we included only studies that defined value from the social science perspective, as a human-generated cognition (Reser and Bentrupperbäumer, 2005). Thus, we excluded studies that defined value solely from an ecological perspective because under this perspective, value is conceptualised as the natural properties, intrinsic features, attributes, or qualities inherent in a specific species or the natural environments, independent of humans. This, according to Reser & Bentrupperbäumer (2005)

should not be referred to as environmental values, but should rather be reframed as environmental properties or attributes. Consequently, studies that examined animal behaviour rather than human behaviour within the context of forest conservation were excluded. Studies that solely focused on assigned economic or monetary valuation of the forest, or direct payments for ecosystem services, without including other non-monetary and indirect values were excluded, because they do not represent the totality of inherent motivations, perceptions/ideas, or beliefs that people hold about the forest, forest resources, and forest conservation.

2.2. Data Screening and Extraction

A two-stage screening was independently carried out by two researchers (EJI and LS). First, studies were screened for suitability for inclusion using their titles and abstracts. Second, full-texts of the studies were screened. Inter-rater reliability was high (Cronbach's alpha = 0.97; a value >0.70 indicates a very good level of reliability (Taber 2018)), indicating that the inclusion and exclusion criteria were clear and unambiguous. Disagreements during screening were discussed between the researchers until an agreement was reached.

Using a data extraction form (see Table A3 and A4 in the appendix), six types of data were extracted, which covered: 1) The article (title, author, year of publication, and study location); 2) Background/contextual (objective of the study); 3) Methodology (study design, study population, sample size, data collection, and analysis); 4) Forest conservation (conservation strategy, and conservation attitudes and behaviours); 5) Value (subject/object of value, and motivational concerns/goals); 6) General results indicating how humans influenced forest conservation attitudes and behaviours.

2.3. Quality Assessment

Included studies followed many different research designs (e.g. quantitative, qualitative, mixed methods). This heterogeneity precludes carrying out a formal meta-analysis (Popay et al., 2006). Consequently, we used a narrative synthesis approach, which brings together pieces of evidence that tell a convincing story about the current state of knowledge regarding a research question, or about the effect of a particular intervention, or the need for policy response (Ryan et al., 2013). Although the use of vote counting in this approach can ignore the magnitude of effect size thereby tallying studies with varied sample sizes and valid statistical significance (Melendez-Torres et al., 2015), we mitigated some of these weaknesses by carrying out a critical appraisal, also known as a quality assessment, of the selected studies. This not only reduced the risk of using low-quality data in our synthesis but also enhanced the strength of our evidence (Haddaway et al., 2020).

We used two approaches to assess the quality of the reviewed studies. For quantitative studies, we used the Environmental-Risk of Bias tool and the Environmental-Grade tool for assessing the internal and external validity of environmental studies (Bilotta et al., 2014) (see Table A5 and A6 in the appendix). The tools were adapted from the bias domains in the Cochrane Risk of Bias Assessment Tool originally designed for clinical and health studies. For a detailed definition of all the bias domains and an explanation of the criteria for judgment, see Bilotta et al. (2014). Using the 7-item Environmental-Risk of Bias tool, papers were judged as Low risk when all sources of bias are assessed as low risk, High risk when one or more sources of bias are assessed as high risk, and Unclear risk when one or more sources of bias are assessed as low risk and unclear risk (Bilotta et al., 2014). The result of the Environmental-Risk of Bias assessment fed into the 7-item Environmental-grade tool, which was used to produce the final score and determine the quality of the quantitative papers. The highest total possible score for cross-sectional and cohort studies was 9 and 10 respectively. Following the Cochrane

196 Collaborations for Systematic Reviews, papers were graded into three quality categories: low
197 quality (score: 1- 3), medium quality (score: 4 - 6), and high quality (7- 9/10).

198 Qualitative studies were assessed using the 10-item Critical Appraisal Skill Programme
199 (CASP, 2018) tool (see Table A7 in the appendix). To obtain a quality score for each study,
200 we rated each item using a numeric score gradient: 0 for 'No', 1 for 'Unclear', and 2 for 'Yes'.
201 The highest total possible score for a study was 20. Using the total score for each study, we
202 classified the studies into three quality categories: low quality (score: 1-7), medium quality
203 (score: 8-14), and high quality (score: 14-20).

204 Quality assessment was carried out by two independent reviewers (EJI and MN). We compared
205 the scores and discussed differences until a consensus was reached. The level of agreement
206 between the two reviewers was calculated using Cohen's Kappa inter-rater reliability test. For
207 both quantitative and qualitative studies, we included only high- and medium-quality papers
208 for our synthesis and excluded the low-quality papers. However, we carried out a sensitivity
209 analysis to ascertain if the exclusion of low-quality papers would alter the result of our
210 synthesis. Sensitivity analysis not only allowed us to confirm that the exclusion of studies
211 perceived to be low quality will not affect the generalizability of our review synthesis (Carroll
212 & Booth, 2015) but also ensured that we did not include studies that will bias our findings or
213 limit our recommendations (Soilemezi & Linceviciute, 2018). By repeating the analysis before
214 and after removing the low-quality studies, sensitivity analysis allowed us to know to what
215 extent removing the low-quality studies would alter the initial result from analysis. Details of
216 excluded low-quality studies are in Table A3 and A4 in the appendix.

217 **2.4. Data Analysis**

218 To identify the human value orientations influencing forest conservation attitudes and
219 behaviours in SSA, we thematically mapped the different motivational concerns/goals that

220 influenced people's interaction with the forest and their protection in the various studies into
221 value types and categorized them into different value orientations. Three broad human value
222 orientations emerged from the analysis: anthropocentric, biocentric, and relational value
223 orientations. These value orientations correspond with Chan et al.'s (2016) three broad domains
224 of the human value system in environmental conservation. We defined the value types using
225 the motivational concerns/goals emanating from the studies.

226 To understand how human values have influenced forest conservation attitudes and behaviours,
227 we carried out a sentiment analysis using the quantitative studies to ascertain how motivational
228 concerns/goals (independent variables) have influenced forest conservation attitudes and
229 behaviours (dependent variables) as positive (significant positive relationships), neutral (no
230 significant relationship), or negative (significant negative relationships). Motivational
231 concerns/goals are the underlying reasons, belief systems, and perceptions that depict an
232 individual's value system (Reser & Bentrupperbäumer, 2005).

233 Following the approach used by Soilemezi et al. (2017), data from the qualitative studies were
234 inductively analyzed to further understand the influence of human values on forest
235 conservation attitudes and behaviours. Data here refers to texts described as 'results' or
236 'findings' in the qualitative studies (Thomas & Harden, 2008). Positive influences are results
237 that show that value orientations supported or encouraged positive attitudes and behaviours
238 towards forest conservation. Contrarily, negative influences are results which indicate that
239 value orientation provided the basis for negative attitude or behaviours towards conservation.

240 Finally, to explore the geographic characteristics of forest conservation and human value
241 evidence from SSA, we mapped how studies were distributed across the countries and sub-
242 regions within SSA. Where a study was carried out in more than one country, we counted the
243 countries where data was collected as individual study sites. Our review also included studies

244 from non-independent territories that are geographically part of SSA. We examined how the
245 proportion of forest area (% of land area) varies across the countries where the studies were
246 carried out. We also examined the methodological details of the reviewed studies such as study
247 design (cross-sectional study or cohort/longitudinal study), sample size, study population, data
248 collection and analysis.

249 **3. Results**

250 Search from the Web of Science and Scopus electronic databases yielded 2,339 and 1,766 hits
251 respectively. Reference lists of these papers were searched, and an additional six studies that
252 met the inclusion criteria were identified, giving a total of 4,111 papers (Figure 1). Duplicates
253 were removed and studies were screened using titles and abstracts. This resulted in 124 papers
254 being taken forward to the full-text screening. The majority of the studies excluded at full-text
255 screening did not wholly or in part indicate a quantitative or qualitative relationship between
256 human values (beliefs, motivational concerns/goals, perceptions) and forest conservation
257 attitudes and behaviours. Others were reviews, i.e., not original research (n=3), book chapters,
258 i.e., not published in peer-reviewed journals (2), and not published in English (2). Full-text
259 screening using other eligibility criteria such as relationships and conceptual definitions of
260 human values and forest conservation reduced the number of papers to 23 and 25 quantitative
261 and qualitative studies respectively.

262 Cohen's Kappa inter-rater reliability values for the quality of quantitative and qualitative
263 studies were 0.679 ($p < 0.05$) and 0.711 ($p < 0.05$) respectively, which implied a good and
264 significant level of agreement between the two reviewers. The outcome of environmental-risk
265 of bias assessment showed that sixteen (70%) of the quantitative studies had unclear risk, four
266 (17%) were of high risk, while three (13%) were of low risk (see appendix Table A8). The final
267 outcome of quality assessment for quantitative studies using environmental-grade assessment
268 tool showed that sixteen (70%) of the quantitative studies fall within the category of medium

quality, five (22%) were of low quality, and only two (9%) were of high quality (see appendix Table A9). For the qualitative papers, 15 (60%) were of high quality, eight (32%) were of medium quality, and two (8%) were of low quality (see appendix Table A10). The outcome of the sensitivity analysis showed that the low-quality studies contributed minimally to the formation of themes (value types) in the review synthesis and our final results.

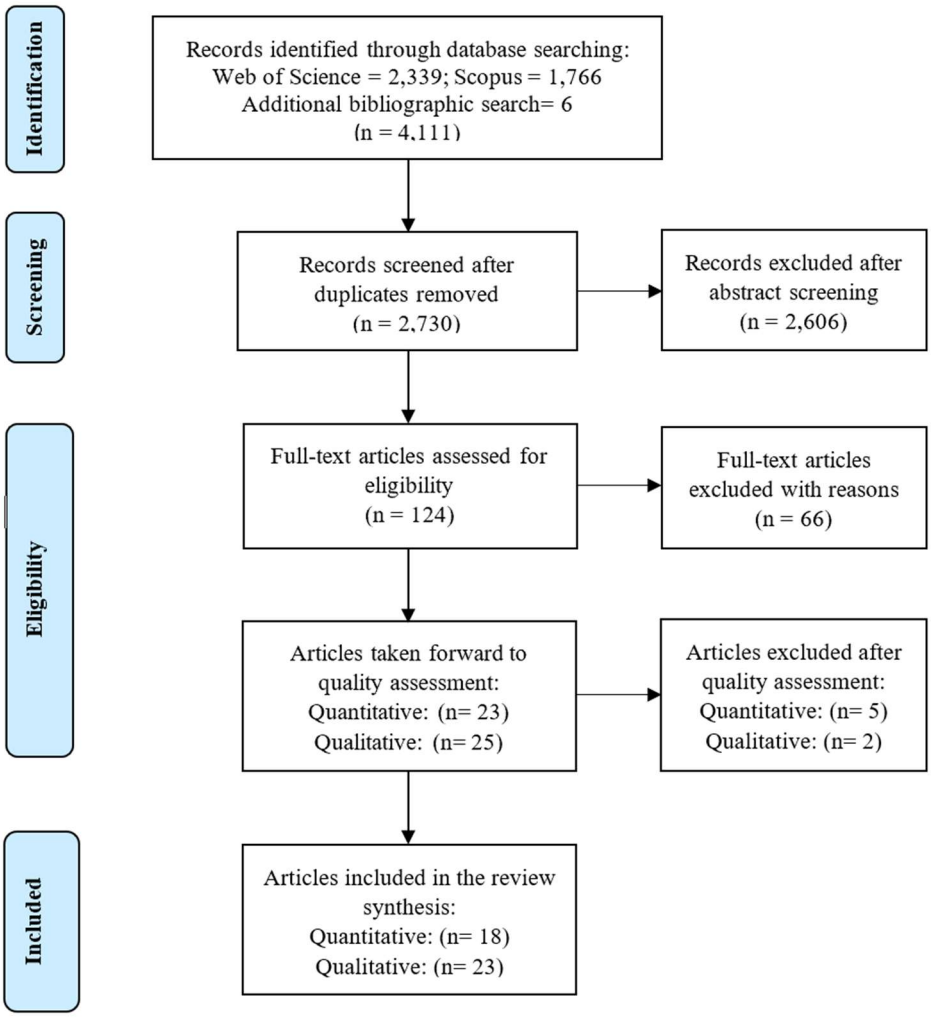

Figure 1: PRISMA flow chart for reporting systematic search process and results.

3.1. Study methodology

Almost all studies, both quantitative and qualitative, employed a cross-sectional study research design. Only two (one quantitative and one qualitative) were cohort studies. The sample size of quantitative studies ranged from 78 to 446 with a median of 226, while the sample size of

281 qualitative studies ranged from 6 to 157 with a median of 44. While all quantitative studies
282 used a questionnaire survey to collect data on human values and forest conservation attitudes
283 and behaviours, a majority (24) of the qualitative studies used interviews with a variety of other
284 approaches such as focus group discussions (8), participant observation (2), oral histories (1),
285 participatory mapping (1), participatory rural appraisal (1), and rapid rural appraisal (1). Study
286 participants were drawn from a wide range of populations including forest and rural households
287 (32), community leaders (9), farmers (8), clergy (3), hunters (2), traditional healers (2), shrine
288 priests (1), ecotourists (1), and conservation experts (1).

289 **3.2. Human value orientations influencing forest conservation attitudes and behaviour**

290 Table 1 summarizes the value types deduced from the motivational goals/concerns influencing
291 forest conservation attitudes and behaviour. Details of the motivational goals/concerns
292 extracted from each study are presented in Table 2 and 3.

293 **Table 1: Value types and value orientations deduced from motivational goals/concerns**
294 **influencing forest conservation attitudes and behaviours in SSA.**

Motivational goals/concerns	Value types	Value orientation
Perceived forest provisioning ecosystem services such as food, fuelwood, fruits, timber, medicinal uses	Subsistence/Economic forest values	Anthropocentric value orientations
Perceived impact of conservation on livelihoods		
Perceived and derived economic benefits from conservation such as income, employment, infrastructure.		
Perceived and derived economic costs from conservation such as human-wildlife conflict		
Perception of forest landscape as community heritage for livelihood support		
Access to the use forest resources in protected areas		
Dependency on forest resources		
Perceived forest regulatory ecosystem services such as climate regulation, rain formation, erosion control	Environmental forest values	
Perception of the forest as being beneficial for agriculture		
Perception of forest as being important for watershed protection and soil conservation		
Perception of protected areas as ecological entities		
Recreational forest uses	Recreational forest value	
Perception of the forest as a place of worship or spiritual protective covering (religious beliefs)	Cultural forest values	
Perception of forest as ancestor abode and burial sites (traditional practices)		
Perception of forest as spiritual and cultural identity		

Traditional customs, rituals, taboos and norms		Relational value orientations
Traditional totems, metaphors, folklores, proverbs, and myths		
Strength of forest conservation rule	Management forest values	
Level of involvement in forest management		
Subjective norms i.e., social pressure to perform a specific behaviour such as compliance with forest rules	Social forest value	
Sense of wellbeing from forest existence	Existence forest value	Biocentric value orientations
Respect, concern, and admiration for forest		
Protection of endangered species and forest wildlife habitat		
Preservation of forest for future generations	Bequest forest value	
Perception of forest aesthetics	Aesthetic forest value	

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296 **Table 2: Motivational goals/concerns and deduced values influencing forest conservation attitudes and behaviours in sub-Saharan**
297 **Africa (SSA), extracted from 18 quantitative studies. Full details extracted from studies, including study objectives and**
298 **methodologies, are provided in Appendix Table A3.**

Study (Year of publication)	Study location	Conservation attitudes and behaviours	Motivational concerns/goals	Deduced value types	Significant positive outcome	No significant effect (neutral)	Significant negative outcome	Quality score
Araia & Chirwa (2019)	Thathe Vondo Forest Reserve and Mafhela Forest Reserve, South Africa	Compliance behaviour	1) Utility values and perceived impact on livelihood, 2) Watershed protection, 3) Strength of conservation rule, 4) Traditional norms, 5) protection of endangered species and forest wildlife habitat	1) Subsistence/Economic value, 2) Environmental value, 3) Management value, 4) Cultural value, 5) Existence value	People who perceived the utility values of forest, watershed protection, cultural values and protection of endangered species and forest wildlife habitat appeared to have positive compliance behaviour	There was no consensus on the strength of enforcement of rules		Medium quality (5)
Gebregziabher & Soltani (2019)	Tigray region in northern Ethiopia	Support exclosures in protected areas	1) Perceived and derived economic benefit from conservation e.g. employment, 2) Perceived forest benefit on reducing erosion	1) Subsistence/Economic value, 2) Environmental value	Local communities support exclosures if they perceive tangible economic and environmental benefits			Medium quality (5)
Abukari & Mwalyosi (2018)	Mole national park, Ghana and Tarangire National Park, Tanzania	Attitude towards national parks	1) Because of access to the use forest resources, and benefit from conservation project e.g. employment, 2) Perception of PAs as ecological entities	1) Subsistence/Economic value, 2) Environmental value	1) Respondents who have access to NTFPs have less negative attitude towards Mole national park, 2) Perception of PAs as ecological entities influenced positive attitudes	In Tarangire NP, access to forest resources had no significant effect on attitude	Low perception of benefits from conservation projects influenced negative attitudes towards PAs	Medium quality (5)
Nsonsi et al. (2017)	Nouabalé-Ndoki NP Northern Congo, Lobéké NP Cameroon, and Dzanga-Ndoki NP Central African Republic	Attitude towards forest elephant conservation	Perception of benefits from conservation e.g. employment, and perception of costs that comes with the conservation of elephant e.g. human-elephant conflict	Subsistence/Economic value	Benefits from conservation influenced positive attitudes towards the conservation of forest elephants		Conservation costs influenced negative attitudes	Medium quality (6)
Ofoegbu & Speranza (2017)	Vhembe district, South Africa	Intention to adopt sustainable forest management practices	Subjective norm i.e. social pressure to perform a specific behaviour	Social value	Subjective norms or beliefs about the approval or disapproval of sustainable forest management (SFM) practices by other relevant people mainly influenced the strong intention to adopt such practices.			Medium quality (5)

Garekae et al. (2016)	Chobe enclave communities, Botswana	Attitude towards forest conservation	Knowledge of forest trees and dependency on forest resources	Subsistence/Economic value	Knowledge of forest trees and dependency on forest resources influenced positive attitudes towards forest conservation			Medium quality (5)
Meijer et al. (2016)	Mzimba and Chiradzulu districts, Malawi	Attitude towards cutting down forest trees	Subjective norm due to prevalent communal value which makes individuals have less control over the behaviour	Social value	Subjective norm influenced positive attitudes by reducing intention towards cutting down forest trees			Medium quality (6)
Dewu & Røskaft (2016)	Mole National Park and Digya National Park, Ghana	Attitude towards protected area	1) Perceived benefit from protected areas, 2) Perceived cost from conservation such as conflicts and losses which affects livelihood conditions	Subsistence/Economic value	Perceived benefit from conservation influenced positive attitude towards PA		Perceived cost from conservation influenced negative attitude towards PA	Medium quality (5)
Cobbinah (2015)	Kakum Conservation Area, Ghana	Attitude and involvement in forest management	1) Derived benefits from conservation such as employment and income, 2) Involvement in management	1) Subsistence/Economic value, 2) Management value	Positive attitudes and increased participation in conservation were largely influenced by derived economic benefits and involvement in forest management.			Medium quality (6)
Baker et al. (2014)	Akpugoeze Enugu State, and Lagwa Imo State, Nigeria	Behaviour towards conservation of monkey	1) Traditional belief, 2) perception of wildlife as a threat to farms	1) Cultural value, 2) Subsistence/Economic value	The traditional belief associated with monkey influenced their protection		Monkeys crop and garden raiding activities encouraged the killing of monkeys	Medium quality (6)
Hartter et al. (2014)	Kibale National Park, Uganda	Attitude towards protected area	Perceived regulatory ecosystem services such as climate regulation, rain formation	Environmental value	Perceived regulatory ecosystem services from national park influenced positive attitudes towards protected area			Medium quality (5)
Nielsen & Meilby (2013)	Udzungwa Mts, Tanzania	Illegal hunting	Perceived benefit from a conservation program	Subsistence/Economic value			Perceived low benefit from conservation motivated continued illegal hunting	High quality (9)
Ramcilovic-Suominen et al. (2013)	Dormaa, Begoro, and Juaso in the High Forest zone, Ghana	Compliance to tree felling rule	1) Extraction of timber, cash crops, earnings from selling forest products, household items, firewood, 2) Clean and healthy air, water, soil, rainfall, shade, animal habitat, 3) Preservation of forest by future generations, 4) Perception of the forest as a place of worship	1) Subsistence/Economic value, 2) Environmental value, 3) Bequest value, 4) Cultural value	Farmers who ascribe high importance to economic forest values and religious forest values are more likely to comply with the tree-felling rule	The study found no association between compliance and subsistence forest values, environmental forest values, and bequest forest values		Medium quality (5)

Sharaunga et al. (2013)	KwaZulu-Natal, South Africa	Participation in community forestry	1) Extraction of firewood, medicinal uses, 2) Preservation of forest by future generations, 3) Sense of wellbeing from forest existence, 4) Recreational uses, 5) Forest uses as a place of worship, burial sites, and ancestor abode	1) Subsistence/Economic value, 2) Bequest value, 3) Existence value, 4) Recreational value, 5) Cultural value	People who hold bequest forest value, existence forest value, recreational forest value, religious/spiritual forest values, and traditional forest value are likely to participate in managing the community forest		People who hold subsistence forest values and medicinal forest values are less likely to participate in managing the community forest	Medium quality (6)
Ezebilo (2012)	Cross River National Park, Nigeria	Satisfaction with community forest project	Contribution of forest project to income from cash crops	Subsistence/Economic value	Respondents who feel that the forest project contributes to their income are satisfied with the forest project			Medium quality (5)
Tesfaye et al. (2012)	Dodola woreda district, Ethiopia	Intention and attitude towards tree planting	1) Forest dependence 2) Subjective norm i.e. perceived behavioural control	1) Subsistence/Economic value, 2) Social value		Subjective norm had no significant effect on intention and attitude towards participation in forest management	One of the factors that negatively influenced intention and attitude to participate in forest management is forest dependence.	Medium quality (6)
Ansong & Røskaft (2011)	Subri Forest Reserve, Ghana	Attitude towards forest reserve	1) Dependence on the forest for livelihood, 2) Preservation of forest for the future generation, 3) Respect, concern, and admiration for forest	1) Subsistence/Economic value, 2) Bequest forest value, 3) Existence value	Respondents who are concerned about the forest or for a future generation had higher attitude score		Respondents who depend on the forest reserve for their livelihood had lower attitude score than those who not derive benefit	Medium quality (6)
Morgan-Brown et al. (2009)	Msasa and Kwezitu in the East Usambara Mountains, Tanzania	Participation in a conservation project	Contribution of the forest to the success of butterfly farming.	Environmental value	Farmers believed butterfly farming would be impossible if local forests were cleared, and butterfly farmers reported significantly more participation in forest conservation behaviours			High quality (8)

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304 **Table 3: Motivational goals/concerns and deduced values influencing forest conservation attitudes and behaviours in sub-Saharan Africa**
305 **(SSA), extracted from 23 qualitative studies. Full details extracted from studies, including study objectives and methodologies, are**
306 **provided in Appendix Table A4.**

Study (Year of publication)	Study location	Conservation attitudes and behaviours	Motivational concerns/goals	Deduced value type	General result	Quality score
Rafidison et al. (2020)	Eastern side of the Malagasy Highlands, Madagascar	Compliance to forest rule	1) Because of the usefulness to Ficus species to livelihoods, 2) watershed protection, soil conservation, 3) Spiritual and cultural identity, 4) protection of forest wildlife habitat	1) Subsistence/Economic value, 2) Environmental value, 3) Cultural value, 4) Existence value	The protection of the nine Ficus species is driven by their multiple uses and varies depending on their distribution in social–ecological facets. Ficus trees that grow from self-sown seedlings near social–ecological facets such as tombs, steles, abandoned ancient villages or elements of landscapes such as large rocks, are systematically protected.	High quality (14)
Sinthumule & Mashau (2020)	Thathe Vondo sacred forest, South Africa	Compliance to forest rule	Traditional Ecological Knowledge (TEK)- Belief (Religious/Spiritual), customs, rituals, myths (Traditional roles)	Cultural value	The key TEK that is used to conserve sacred forest in the study area includes rituals and customs for the protection of ancient burial grounds. The positive attitudes equated to compliance as local communities were found not to harvest fuelwood or hunt in the sacred forest because of TEK.	High quality (16)
Mavhura & Mushure (2019)	Nharira communal lands of Chikomba district, Zimbabwe	Promote natural resource conservation	Indigenous knowledge customary rules and regulations, rituals, taboos, totems, metaphors, and proverbs	Cultural value	Indigenous knowledge constitutes the social and religious values of the Nharira community that are used in conserving the human-environment system. However, shifting values resulting from change of faith from traditional belief to Christianity are eroding indigenous practices used for forest and wildlife conservation.	High quality (17)
Mmahi & Usman (2019)	Kainji Lake National Park, Kaiama; Nigeria	Compliance to forest rule	Perception of forest landscape as community heritage for livelihood support	Subsistence/Economic value	Findings from the study showed that community rationalization and justification of hunting as their heritage, and perception of the establishment of KNP as an incursion on their heritage was a major force propelling illegal hunting and pressure on the park.	Medium quality (13)
Ruelle et al. (2017)	Debark District, Ethiopia	Conservation of indigenous forest tree species	Knowledge about customs and traditional ethos of tree planting	Cultural value	Ethiopia's church forests nurture the knowledge necessary to promote plant diversity in the rest of the landscape and serve as archetypes for community-driven conservation.	High quality (15)
Costa et al. (2017)	Tombali region, Cantanhez Forest National Park, Guinea Bissau	Attitude towards conservation	Perception of conservation as a threat to people's welfare	Subsistence/Economic value	Women felt the Park was responsible for malnutrition in the communities due to damage of crops by wildlife.	High quality (19)
Asante et al. (2017)	Ashanti Region, Ghana	Protection of indigenous forests	Traditional practices and religious belief	Cultural value	Beliefs, taboos, myths, proverbs, and songs were vital traditional systems used by the Ashantis to effectively conserve their forests. Cultural practices and traditional beliefs	High quality (16)

					were found to be more useful in conserving forests more than the government-controlled forests	
Klepeis et al. (2016)	South Gondar Administrative Zone of the Amhara Regional State, Ethiopia	Protection of sacred church forest	Belief and traditional roles such as burial sites	Cultural value	Church forests represent an unusual form of community-based protection that integrates locally controlled common property with external institutional arrangements: this hybrid system is highly effective at protecting the forest while maintaining cultural practices	Medium quality (13)
Fritz-Vietta (2016)	Mananara-Nord, and the SahamalazaIles-Radama Biosphere Reserves, Madagascar	Achievement of wellbeing	1) Use of forest woods, medicinal plants, food, 2) Protection against erosion, 3) Forest aesthetics	1) Subsistence/Economic value, 2) Environmental value, 3) Aesthetic value	The local population's views on valuable natural elements serve to indicate what they consider important for the achievement of well-being	High quality (16)
Fraser et al. (2016)	Gbarpolu, Bong, Lofa, and Nimba in Northwestern, Liberia	Attitude towards agroforestry	Ancestor worship and ritual	Cultural value	Sacred agroforests are shaped and conserved by local cultural institutions revolving around ancestor worship, ritual, and the metaphysical conceptual category. However, the practice of sacred agroforestry is under threat from a generational shift in cultural valuation as youths have begun to challenge cultural worldviews such as sacredness of forests.	High quality (15)
Irakiza et al. (2016)	Buhanga sacred forest in Musanze District, Rwanda	Protection of sacred forest	1) Traditional norms, 2) the use of medicinal plants	1) Cultural value, 2) Subsistence/Economic value	Cultural norms and values associated with the sacred forest has led to non-exploitation.	Medium quality (13)
Ouma et al. (2016)	Kakamega Forest, Kenya	Sustainable forest use	Beliefs, practices, and norms	Cultural value	The local community applied various beliefs, practices, and norms to regulate the use of Kakamega Forest.	High quality (14)
Mariki (2013)	Kiliimanjaro National Park, West Kilimanjaro Forest Plantation, Tanzania	Attitude towards conservation	1) Benefits from conservation (income, employment, infrastructure), 2) Involvement in park management	Subsistence/Economic value	The extent of participation and amount of benefits accrued are found to have a paramount role in determining local people's attitude to conservation.	High quality (14)
Baker (2013)	Akpugoeze, Enugu State and Lagwa Imo State, Nigeria	Support for the conservation of Sclater's monkeys	Belief, taboos, folklores	Cultural value	Folklore contributed to the continual observance of the taboos against harming monkeys. However, support for the taboos is weakened by the monkeys' crop- and garden-raiding activities and, due to widespread adoption of Christianity by residents.	High quality (16)
Cocks et al. (2012)	Grahamstown, Alice, and Peddie districts of the Eastern Cape Province, South Africa	The wellbeing of local people	Perception of the forest as a spiritual protective covering	Cultural value	Maintenance of biodiversity and natural vegetation is as much in the interest of the local community's well-being as it is in the interest of conservation planners. This is because of the local peoples' perception of the forest as a spiritual protective covering, a place that bestows spiritual health and well-being	Medium quality (13)

Scales (2012)	Central Menabe, Madagascar	Sustainable forest use	1) Perception of the forest as inexhaustible material and beneficial for agriculture, 2) Perception of the forest as an abode of spirits and ancestors	1) Subsistence/Economic value, 2) Cultural value	There is a misunderstanding of the values and beliefs of rural households. The forest is not seen as something to be protected but to be respected and used responsibly according to *fady* and the ancestors.	High quality (16)
Fournier (2011)	Bondoukuy region, Burkina Faso	Protection of forest vegetation	Beliefs and ritual practices	Cultural value	Ritual practices are much more diverse and fluid than might have been supposed. Protection 'by tradition' is thus rather different from what we call conservation. While vegetation does matter, its presence on sacred sites is not essential. It shows the inadequacy of sacred forests as a category of forest conservation	Medium quality (12)
Tabuti et al. (2009)	Nawaikoke Sub-county, Uganda	Willingness to conserve forest woody species	Economic uses of forest woody species	Subsistence/Economic value	The study shows that community members are interested in conserving prioritized trees with utility values and ignore others	Medium quality (13)
Jones et al. (2008)	Fianarantsoa province, Madagascar	Protection of endemic forest species	Taboos, norms	Cultural value	Taboos reduced pressure on some economically important endemic species by preventing their sale or limiting the harvest season	High quality (16)
Tengö et al. (2007)	Southern Androy, Madagascar	Protection of endemic forest species and conservation of forest landscape	Taboos, sanctions	Cultural value	Over 90% of the total remaining forest cover is protected through taboos, these informal institutions represent an important, and presently the only, mechanism for conservation of the highly endemic forest species.	Medium quality (12)
Ormsby& Kaplin (2005)	Masoala National Park in north-eastern, Madagascar	Perception of a national park	Derived or perceived benefits from the park	Subsistence/Economic value	One of the factors found to influence the perceptions of the park is actual or potential benefits received from the park	High quality (16)
Marcus (2001)	Masoala, Ranomafana, and Andohahela National Parks, Madagascar	Support for a conservation project	Perception of benefit and cost of conservation, e.g. impact on the livelihood	Subsistence/Economic value	Focus group responses, however, indicate that while some people may feel they are benefiting from land-use change initiatives, they do not associate these with the park	Medium quality (12)
Lykke (2000)	Fathala Forest, Senegal	Attitude towards conservation	1) Material benefits derived from woody forests such as timber, medicinal forest uses, 2) Belief that the forest brings rain.	1) Subsistence/Economic value, 2) Environmental values	The study shows that local people expressed concern about the status of the woody vegetation and a wish for its conservation. However, their positive attitude towards conservation is motivated by the material benefits they derive from the woody forests	High quality (15)

3.2.1. Anthropocentric value orientation

Fourteen (from 18) quantitative studies identified subsistence/economic values which are motivated by human dependence on the use of forest resources or the perceived/derived impacts of conservation on individual/household income and livelihood. Subsistence/economic value was associated with factors such as benefits of forest provisioning ecosystem services (e.g. extraction of firewood, timber, fodder, food, fruit, meat, medicinal forest uses), benefits of conservation projects (e.g. employment, road construction), and cost of conservation projects (e.g. human-forest conservation conflict, loss of livelihood due to conservation). Eleven out of the 23 qualitative studies also identified this subsistence/economic value. Environmental value was another type of anthropocentric value orientation that is relatively common in many studies. Six and three quantitative and qualitative studies respectively identified this value type, motivated by the ecological functions of the forest or the derived/perceived benefits of forest regulatory ecosystem services such as watershed protection, rain formation, soil protection, erosion control, provision of clean and healthy air. Only one quantitative study identified recreational value, which is the human value that seeks to use the forest for recreational pursuits. Overall, more studies (66%) identified anthropocentric value orientations than any other value orientation.

3.2.2. Relational value orientation

The most common relational value type found in the reviewed studies was cultural value. Most (15 out of 23) of the qualitative studies identified this value type, while four quantitative studies identified it. The motivational goals/concerns associated with cultural values are linked to traditional practices, customs, religious beliefs, and perceptions about the forest and forest resources. Many local people who hold this value perceive the forest either as a place of worship or as an ancestral abode that offers some sort of spiritual protection. Traditional tools used to protect such forests include norms, sanctions, taboos, myths, folklores. Another

relational value type identified by only three quantitative studies was social value, motivated by subjective norms, i.e., social pressure to perform specific behaviour that affects forests or forest conservation. Management value, which relates to people's perception of forest management strategies, level of involvement and participation in conservation management, or strength of conservation rules, was identified by only two quantitative studies and one qualitative study. Overall, many studies (56%) identified relational value orientation after anthropocentric value orientation.

3.2.3. Biocentric value orientation

We identified three value types that fall under the category of biocentric value orientation. The first was existence value which is motivated by a sense of wellbeing, respect, concern, and admiration for forest existence. However, only three quantitative studies and one qualitative study identified this value type. Bequest value was another biocentric value type motivated by the preservation of forests for future generations. Only three quantitative studies identified this value type. Aesthetic value is the human value motivated by the intrinsic attraction to the beauty of the forest landscape or forest resources. Only one quantitative study identified this value type in our review. Overall, biocentric value orientation was the least covered of the value types identified by studies in SSA (12%).

3.3. Influence of human values on forest conservation attitudes and behaviours

Studies identified different forest conservation attitudes and behaviours (Tables 2 and 3) such as compliance to forest rules, sustainable forest use, participation in forest management, support for protected areas, local acceptance of conservation projects, attitudes towards protected areas or towards conservation practices, preference for forest conservation, intention to adopt sustainable forest practices, and satisfaction with forest projects, and willingness to pay for conservation. Out of the 18 quantitative studies, 11 that identified anthropocentric value orientations highlighted positive influence on one or more forest conservation attitudes and

behaviours, while eight studies identified negative influences. Only two studies reported neutral (no effect) influence of anthropocentric values on forest conservation attitudes and behaviours.

We found that anthropocentric value orientation linked to the perception of forest provisioning ecosystem services, benefits from conservation projects (subsistence/economic values), perception of forest regulatory ecosystem services (environmental value), and recreational forest values, positively influenced people's support for conservation, willingness to pay for conservation, involvement and participation in conservation management and practices, and compliance with forest rules. Anthropocentric values linked to dependence on forest resources, low benefits from conservation projects, and costs of forest conservation such as human-wildlife conflicts (subsistence/economic values), influenced negative attitudes and behaviours like disobedience of forest rules resulting in increased hunting and poaching, pressure on protected areas, less support for or unwillingness to participate in conservation, and generally negative attitudes towards protected areas. The results from qualitative studies also supported those of the quantitative studies. Out of the 11 qualitative studies that identified anthropocentric values, eight reported that several positive conservation attitudes and behaviours such as willingness to conserve forest species, sustainable forest use, participation in conservation projects, and protection of forest landscapes were motivated by utility values of forest resources (e.g. medicinal uses, food, timber), derived conservation benefits (e.g. income, employment, infrastructure), and perceptions of forest as being beneficial for agriculture (e.g. the forest brings rain).

Cultural values were the dominant relational value identified by the studies. All four quantitative studies that identified cultural value highlighted its positive role in the preservation of forest and forest species with sacred status. Out of the 15 qualitative studies that identified cultural values, 13 reported that cultural practices, traditional religious beliefs, rituals, customs

383 and taboos have played a key role in preserving forest landscapes and forest species with sacred
384 status.

385 Two out of the three quantitative studies that identified social value highlighted its positive
386 effect to influence intention to comply with forest rules, while only one study highlighted a
387 neutral effect. The studies that identified management value highlighted that forest
388 management strategies that involve local people or are perceived as strong, positively
389 influenced participation and preference for conservation.

390 Although few studies identified biocentric value orientation, both the quantitative and
391 qualitative studies that highlighted existence, aesthetic, and bequest values show that they
392 positively influenced attitudes towards forest conservation. People who hold such values are
393 more likely to participate in and support forest conservation practices. However, two out of the
394 three quantitative studies that identified bequest values reported a neutral effect. No record of
395 negative influence on forest conservation attitude and behaviour was associated with the
396 biocentric value orientation.

397 **3.4. Geographic characteristics of forest conservation and human value evidence in SSA**

398 The 41 included studies were conducted in 19 of the 52 countries in SSA (Figure 2).
399 Madagascar (n=7), South Africa (n=5), Ghana (n=5), Ethiopia (n= 4), Nigeria (n=4), and
400 Tanzania (n=5) hosted the most studies. The proportion of forest area (% of land area) varies
401 across these six countries, with Tanzania having the most at 52% and Nigeria the least, with
402 7%. Except for Guinea Bissau (70% forest area) and Congo (65% forest area) where we found
403 one study each, we did not find studies in the top 10 countries with the largest forest area in the
404 SSA, such as Gabon (90% forest area), Seychelles (88% forest area), Democratic Republic of
405 the Congo (67% forest area), and Zambia (65% forest area). We found two different studies

carried out in more than one country (Nsonsi et al., 2017; Abukari & Mwalyosi, 2018). However, no single study was carried out across the entire region.

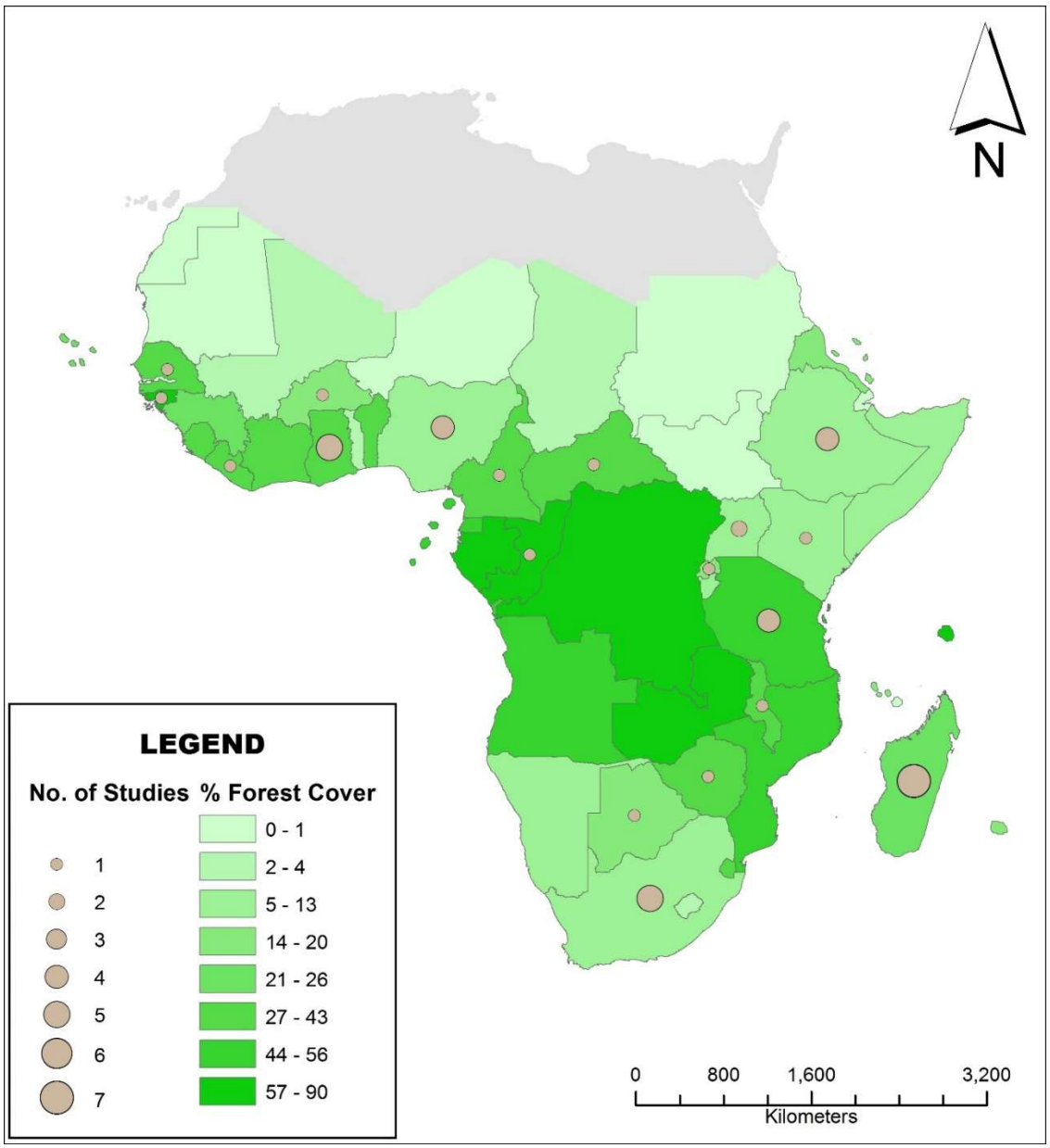

Figure 2: Map of Africa showing 19 countries in the sub-Saharan region where the selected studies for the review were carried out. The bubble sizes represent the number of studies selected from each country. The deeper green shades show countries with a higher proportion of forest area (% of land area), while the lighter green shades are countries with a smaller proportion of forest area (FAO, 2016).

4. Discussion

The concept of value is multifaceted and can influence human attitude and behaviour towards forest conservation in many ways. This scoping review identified the range of human values influencing forest conservation and provides novel insight into the directional influence of value orientations on forest conservation attitudes and behaviours. The findings suggest that anthropocentric and relational value orientations can both positively and negatively influence a number of forest conservation attitudes and behaviours, albeit with more evidence for positive influence, which depends on the perception or motivational goal/concern driving the value.

4.1. Anthropocentric value orientation

Regarding anthropocentric value orientation, the perception of forest provisioning and regulatory ecosystem services (economic/subsistence and environmental values), benefits from conservation projects, and knowledge of other non-use forest values, generated instrumental value systems. Such systems provided the basis for positive attitudes and rural support for conservation and contributed to the protection of endemic forest species. As reported by Störmer et al. (2019), high conservation benefits trigger positive attitudes towards conservation. This confirms the evidence from previous studies that conservation projects designed to provide economic benefits, support livelihoods, and build local capacities are more successful than those that strictly focus on biodiversity conservation (Brooks et al., 2012, Nilsson et al., 2016). This suggests that conservation initiatives that incorporate economic and social development components are more likely to lead to positive attitudes and behaviours towards forest conservation.

On the contrary, anthropocentric values linked to dependence on forest resources, low benefits from conservation, or associated conservation costs, tend to trigger negative conservation attitudes and behaviours. Several studies from other developing countries have shown that high dependence on natural resources is associated with individuals and households of low-income

status who also lack alternative means of livelihood (Abdullah et al., 2016; Hussain et al., 2019). This is very common in SSA where over 70% of the rural population directly or indirectly depend on the forest for their livelihood (World Bank, 2017). Such people may perceive conservation efforts such as forest reserves as a threat to their livelihood, especially when the conservation strategy restricts their access to forest resources (Tesfaye et al., 2012). One way to accommodate people with such anthropocentric values is to design and follow conservation strategies that not only engage and involve local people in conservation management, but also allow them to sustainably use forest resources (Sharaunga et al., 2015; Garekae et al., 2016).

The overall review of anthropocentric values shows that, contrary to arguments that anthropocentric values can be in opposition to environmental conservation, (Kopnina et al., 2018; Sharaunga et al., 2013), it appears that such values can also be a powerful source of motivation to draw support for conservation. People who hold anthropocentric value orientations can participate in forest conservation especially when conservation efforts involve local participation and are beneficial to humans. This, however, should not be mistaken for biocentric value because of the difference in their motivational goals or concerns. While support for conservation emanating from biocentric values is motivated by intrinsic concern for nature, the support emanating from anthropocentric values is motivated to use and material benefits, a philosophy known as shallow ecology (Gaia & Jones, 2017).

4.2. Relational value orientation

Relational value orientation was dominated by cultural values in SSA. We found evidence suggesting that the perceptions of the forest through a cultural lens positively influenced a number of conservation attitudes and behaviours, although this seems to be limited to forest landscapes with sacred/religious status. Studies showed that people with cultural values revere the forest and seek to achieve a feeling of transcendence through interaction with it. This type

of value elicits a kind of cultural-ethical concern regarding the use of forest resources, thereby conferring a moralistic value on the forest (Kellert 1996; Herrmann et al., 2013). This value not only promotes its sustainable use but has also led to the conservation of indigenous forest species. For instance, several forest trees like the African Yellowwood Tree (Afrocarpus falcatus) in South Africa and Ethiopia, forest animals like Sclater's Monkey (Cercopithecus sclateri) in Nigeria, Mona Monkey (Cercopithecus mona) and Patas Monkey (Erythrocebus patas) in Ghana, all owe their continued existence to the traditional beliefs and customs associated with them (Ormsby, 2012; Baker et al., 2014).

In some cases, traditional systems and knowledge-bases were found to be more useful in conserving forests than government rules. The maintenance of forest biodiversity is also as much in the interest of the local people as it is in the interest of conservationists, due to local people's perceptions of the forest as a place that provides spiritual well-being or communal identity. Some studies from other parts of the world have shown that the perception of the forest as a sacred geographical space, a place of worship, and an abode of ancestral spirits, confers a spiritual and symbolic value on the forest (Kellert 1996; Huang et al., 2020). These values have served as a crucial instrument for the conservation of such forests. Reflecting on the cultural value approach to conservation, Infield et al. (2017) noted that cultural values can enhance efficacy, equity, and acceptability of conservation projects. In comparison to other protected forest landscapes, it appears that forest loss or forest exploitation is lower in forests considered sacred than those not linked to any form of cultural value (Asante et al, 2017). In India, Ambinakudige & Sathish (2019) reported that species richness and diversity were greater in sacred forest landscapes than in other landscapes without sacred status. Similarly, Araia & Chirwa (2018) found that compliance behaviour was more positive in culturally protected forests than in state-protected forests which recorded more non-compliance to forest rules. Sacred forests, therefore, act as shadow conservation sites by maintaining and preserving forest

biodiversity as a by-product of their religious and cultural roles (Cardelús, et al., 2015). Various international bodies such as the United Nations Convention on Biological Diversity (UNCBD), Fauna & Flora International, World Bank, and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) all recognized this cultural dimension of human values in forest conservation. For example, Article 8 (j) of the UNCBD notes the need to recognize and preserve indigenous practices related to the sustainable use of forest biodiversity among local communities (United Nations, 1992).

Despite the positive effects of cultural values, reliance on them for sustainable forest conservation should be approached with caution, because of their vulnerability to the influence of stronger external factors and socio-cultural changes occurring within rural communities such as spread of foreign religions like Christianity and Islam, rapid population growth, globalization, and the diminishing regard for culture and tradition among young people (Mavhura & Mushure, 2019). These factors pose a threat to the potency of cultural values to sustain local conservation norms and cultural practices and have contributed to their gradual decline within the SSA region. The erosion of cultural values and practices used for forest conservation also points to the inadequacy of cultural values to support conservation. Further, some cultural practices have been perceived as inimical to modern society due to their restrictions on human freedom (Cardelús, et al., 2015), while others such as the *hatsake* (slash-and-burn agricultural practice) in Madagascar has been described as destructive and unsustainable, and detrimental to forest conservation by conservation experts (Scales, 2012). Other studies have revealed that the strong cultural attachment to some forests has made it difficult for local people to accept some conservation efforts, especially those limiting their access to the forest (Nkemnyi et al., 2013). Consequently, cultural value can be a weak and inadequate value system for conservation (Jones et al., 2008; Sinthumule & Mashau, 2019).

4.3. Biocentric value orientation

Unlike in many developed countries where different studies have shown that biocentric value orientation is fast gaining prominence (Bengston et al., 2004; Taylor et al., 2020), we found very few studies that identified the presence of this value orientation in SSA. While this may be a result of the lack of studies focusing on biocentric value orientation, it may also be connected to the poor economic status of the region. As posited by Bettin & Wollni (2018), low-income populations who are still grappling with basic livelihood needs may find it difficult to appreciate the forest for its intrinsic values. This does not mean that people of low-income status do not care about the environment. On the contrary, they have a stronger basis to be concerned about environmental issues because of their high vulnerability to the effects of environmental disasters (Eisenstadt & Jones, 2017). The challenge, therefore, may likely be that their poor economic status acts as a barrier by offering them limited opportunity to appreciate the forest without attaching any utility value. One possible way to flatten the effect of this economic barrier is to intensify environmental education efforts within the region. According to Chen (2019), irrespective of economic status, people's biocentric value increases when they are aware of the impact of their environmental decisions and behaviours.

4.4. Geographic characteristics of forest conservation and human value evidence in SSA

Geographically, the body of evidence from the southern Africa sub-region concentrated in Madagascar and South Africa, neglecting other southern African countries with greater proportions of forest areas such as Zambia, Angola, and Mozambique. As is standard practices, our scoping review was restricted to the peer-reviewed literature, which is largely written in English. This may mean that some findings from Francophone and Lusophone countries were not included. However, a substantial number of studies were carried out in Madagascar, which illustrates that language is not necessarily a primary driver of the geographic patterns we observe. The dominance of studies in Madagascar may be related to the unique biodiversity in the country which has attracted substantial research and conservation interest and investment.

For instance, Madagascar has a network of over 100 protected areas. Furthermore, of its 10,000 tree species, 90% are endemic (Waeber et al., 2019). Previous studies have shown that research efforts in a particular area lead to more research (Lima et al., 2011). The dominance of studies from South Africa may be related to the fact that the country has the most developed research-base in SSA. A breakdown of research collaborations and publications in Africa by Adams et al. (2014) shows that research outputs from southern Africa are dominated by South Africa. Overall, studies from southern Africa sub-region show that forest conservation has been largely influenced by cultural values linked to the protection of sacred forests and bio-cultural forest species and utilitarian values linked to the protection of forest trees with economic benefits.

In East Africa, while the majority of studies from Ethiopia were around the conservation of church forests associated with the Ethiopian Orthodox Christian religion, studies from Tanzania focused more on conservation around national parks and forest reserves. In West Africa, the majority of the studies which came from Ghana and Nigeria focused on the conservation of bio-cultural forest species, sacred forests, and also conservation around national parks. Central Africa, despite being the sub-region with the highest proportion of forest area in SSA, had the least number of studies, although this may be attributed to the fact that the majority of countries in this sub-region are French-speaking and so most likely to publish in non-English journals. Further, research may be difficult given political situations and conflicts in several Central African countries, resulting in a lower number of published papers.

5. Conclusion

Effective forest conservation requires in-depth knowledge and understanding of the values that drive attitudinal and behavioural preferences towards forests and their protection. In this review, nine value types that fall within three broad human value orientations influencing forest conservation attitudes and behaviours in SSA emerged. Using a pluralist approach to examine human values influence, we provide novel insight into how value orientations can positively

563 or negatively influence several forest conservation attitudes and behaviours. Unlike the
564 unidimensional approach which measures human values using a single scale such as the
565 monetary worth of forest resources (e.g. D'Amato et al., 2016), thereby providing a partial view
566 of people's forest values, we employed a multidimensional scale which recognizes the diverse
567 values people hold of the forest and its conservation.

568 While several studies recognized the potential of cultural values to support the conservation of
569 community forests, especially those with sacred status, there are still mixed conclusions
570 regarding the sustainability and effectiveness of this value orientation to achieve conservation
571 goals in the face of multiple challenges. There is, therefore, a need for more in-depth studies to
572 understand the broader values of culturally protected sacred forests. More studies are also
573 needed to examine the status of biocentric values, especially in SSA and factors affecting such
574 values, considering the low number of studies that have identified this value orientation in the
575 region. Finally, considering the significant effects of human values on forest conservation,
576 further research in this area may usefully examine how various national forest conservation
577 policies have integrated the concept of human values.

578 Conservation activities can restrict local people's value of the forest to only the utilitarian
579 dimension (Rickenbach et al., 2017). However, the attitudes and behaviours of most local
580 people towards forests and their conservation is influenced by both anthropocentric (especially
581 utilitarian, economic/subsistence values) and relational values (especially cultural values).
582 Forest conservation can be both a means of preserving their source of livelihood and also a
583 mechanism for maintaining their source of spiritual connection and traditional practices. This
584 understanding is critical for successful conservation because, one of the common features of
585 human values is that they are contextually specific and most times embedded within a culture
586 (Jones et al., 2016). As noted by Manfredo et al. (2016), they are also unlikely to change for
587 the sake of conservation. Conservation managers should therefore first understand the

prevalent and dominant contextual values guiding people's perception and interaction with the forest, and design their management strategies to fit into the existing value structure. For example, a utilization-oriented strategy and community development approach may be more successful in a locality dominated by anthropocentric values, whereas a strategy that recognizes traditional beliefs and practices and links them up with forest conservation may be more effective in a locality dominated by cultural values.

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