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Title: The role of religion in community-based natural resource management

Author names and affiliations:

Michael Cox (Corresponding author)
Michael.e.Cox@dartmouth.edu
Environmental Studies Program
Dartmouth College
6182 Steele Hall, Hanover, NH, 03755
001-603-646-0544

Sergio Villamayor-Tomas
sevillam@indiana.edu
Workshop in Political Theory and Policy Analysis Indiana University 513, N. Park Avenue,
Bloomington, IN, 47408
001-812-855-3150

Permanent Address:
sergio.villamayor-tomas@cms.hu-berlin.de
Agricultural Economics: Resource Economics Humboldt University
13 Philip St., Berlin, Germany, 10099
+49-30-2093-6069

Yasha Hartberg
yasha.hartberg@gmail.com
Department of Biological Sciences
Binghamton University
Binghamton, NY 13902
001-607-777-4527

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Abstract

Community-based natural resource management plays an important role in biological conservation and natural resource management. Nevertheless, traditional management systems and practices have sometimes been disregarded as anachronistic in favor of modern conservation and management practices. These traditional systems frequently include religious beliefs. Unfortunately, little has been done to explore and document the role that religion may play in traditional community-based natural resource management (CBRM). This paper presents a meta-analysis of case studies of CBRM involving religious beliefs in order to examine whether important governance functions are frequently implemented via religious belief systems. Our findings are that several important governance functions and supporting properties, such as sanctioning and leadership, are implemented as religious practices and through beliefs in the supernatural. We conclude that such belief systems shouldn't be discarded as irrational or outdated, but should be accounted for as modern conservation measures continue to be implemented.

1   1) INTRODUCTION

2   It has been well-established that communities of natural resource users can play important roles in natural

3   resource management (Cinner and Aswani 2007; Shahabuddin and Madhu 2010). Relatedly, the

4   conditions under which communities of users are able to successfully manage common-pool resources

5   (CPRs) such as forests and fisheries have been the topic of much research (Ostrom 1990, Agrawal 2001).

6   Within this work, a variety of conditions have been found to increase the likelihood that communities will

7   cooperate to avoid resource degradation and the tragedy of the commons (see Hardin 1968). Examples of

8   such features include effective monitoring and sanctioning processes, property rights and enforcement

9   mechanisms that limit access to an exhaustible resource, and small-to-medium group sizes. What have

10   been less explored are the mechanisms by which such properties are implemented.

11

12   Meanwhile, many have argued that such mechanisms cannot be implemented automatically as if one were

13   following a recipe. In this vein, much of the institutional literature on community-based resource

14   management (CBRM) has been criticized for supposedly de-emphasizing the cultural context within

15   which particular governance functions are implemented, or for taking an a-contextual, blueprint approach

16   to institutional implementation (see Cox et al. 2010). There is a concern that prescriptions for particular

17   governance functions might be made without regard to the existing traditions and institutions already in

18   place, and that in such cases these prescriptions could crowd out or otherwise poorly combine these

19   traditions. These concerns are supported by research in psychology showing that resource users value

20   procedural issues as much as the outcomes achieved (DeCaro and Stokes 2008).

21

22   Given these critiques, it seems reasonable to conclude that how a particular governance function is

23   implemented is just as important as whether it is or not. There are multiple ways in which important

24   governance functions can be implemented, but one important distinction is between implementation via

25   self-governance and implementation via some external imposition by a state or private actor group. The

26   history of externally imposed governance has some unfortunate chapters, and many of these have been

27   driven by a disregard for local forms of knowledge and belief systems that play important natural resource

28   management roles (Scott 1998). Religious belief systems may come under particular scrutiny in this

29   regard, given the tendency for many to disregard them as irrational anachronisms, as we describe below.

30

31   To address these concerns and this gap in past research, in this paper we use a meta-analysis to explore

32   how important CPR governance functions are implemented, with a specific focus on religious beliefs. We

33   do so in order to answer the following guiding research questions: are there particular governance

34   functions that are amenable to religious implementation, and others that are less so? For those that are, it

35   would presumably be wise to be sensitive to this possibility when practitioners are making institutional

36   prescriptions and thinking about their implementation. Additionally, for those functions that are

37   implemented religiously, we ask: what are the common mechanisms by which religious beliefs and

38   practices accomplish this implementation?

39   2)   BACKGROUND

40   This analysis is motivated by two streams of research: one on CBRM, and the other on the relationship

41   between religion, evolution, and human behavior. We briefly discuss each of these research programs

42   here. To begin, much of the work on CBRM of CPRs is motivated by the observation that managing such

43   resources sustainably is both important and non-trivially difficult. This difficulty derives from the two

44   defining characteristics of CPRs: subtractability and high cost of exclusion (Ostrom et al. 1994).

45   Subtractability means that one user's consumption of a resource subtracts from what is available to others.

46   High costs of exclusion mean that it is difficult to prevent non-users from consuming the resource or to

47   otherwise impose obligations on those who use it. These properties lead to at least two types of collective-

48   action problems, which are dilemmas for a user community caused by a divergence between individual

49   and community-level interests. First, appropriation problems result from the challenge of motivating

50   individuals to forego excessive consumption of a subtractable resource. A provision problem, or public

51 good problem, results from the challenge of motivating individuals to contribute to the physical and social

52 infrastructure that makes appropriation possible. This occurs because it is difficult to exclude non-

53 contributors from benefiting from, or free-riding on, the efforts of contributors. From this perspective,

54 questions about CPR governance become largely about exploring those factors that enable or impede

55 human cooperation in the face of ubiquitous collective-action problems.

56

57 The methodological basis for this project is past work on CBRM conducted at the Workshop in Political

58 Theory and Policy analysis at Indiana University. During the 1980s and 1990s, important synthetic work

59 was conducted at the Workshop that helped move the field forward. Previous to this work, there had been

60 many case studies of CBRM conducted, but these used idiosyncratic protocols that could not be used to

61 produce generalizable findings. To confront this problem, colleagues at the Workshop conducted a meta-

62 analysis, using a coding form to consistently extract information from a range of cases to enable

63 comparison across them. The main product of the Workshop's efforts during this time period was

64 Ostrom's design principles for sustainable CBRM, which she presented in Governing the Commons

65 (Ostrom 1990). These have since been validated by a subsequent meta-analysis of the 20 years of

66 literature published since 1990 (Cox et al. 2010).

67

68 In addition to the design principles, a broad array of variables has been found to affect the ability of

69 communities to successfully manage CPRs. These variables have traditionally been divided into three

70 types: institutions, community attributes, and resource characteristics (Agrawal 2001). Examples of

71 institutional arrangements include several features that have already been mentioned: monitoring,

72 sanctioning, and multiple levels of organization. Community attributes mostly involve group size,

73 leadership, social capital, and various types of heterogeneity. Relevant resource attributes include spatial

74 extent and heterogeneity, visibility, and temporal predictability.

75

76   In addition to building on previous work on CBRM, this analysis is motivated by developments in

77   evolutionary religious studies. Religious beliefs, when examined from a purely rationalistic framework

78   outside their social context, can seem irrational. In competitive environments, however, natural selection

79   will favor behaviors that lead to better survival and reproduction regardless of the supposed factual or

80   material accuracy of the beliefs that motivate those behaviors (Wilson 2002). Just as many different

81   genotypes may lead to the same adaptive phenotype, many different beliefs can elicit the same adaptive

82   behavior, including adaptive natural resource governance. Individuals who engage in adaptive behavior

83   will, on average, survive and reproduce at higher rates than those who do not. When they do they will not

84   only pass on their genes, but in many cases also their beliefs, to their progeny (Jablonka and Lamb 2005;

85   Richerson and Boyd 2005). Importantly, selection in human populations can also operate at the level of

86   groups such that groups engaging in collectively adaptive behaviors can outcompete groups with less

87   adaptive behaviors (Boyd and Richerson 1990; O'Gorman et al. 2008; Wilson 1997; Wilson and Kniffin

88   1999). For instance, groups that can solve problems related to cooperation can muster more resources to

89   achieve more than groups that are less cooperative.

90

91   If religion can help implement factors found to be important in achieving and maintaining cooperation in

92   CBRM research, then it could have an adaptive function. Religion could overcome the fundamental

93   problem of cooperation in multiple ways, and we provide some illustrative examples here. First, many

94   religions require costly signals of commitment (Irons 1996; Sosis and Bressler 2003). These can range

95   anywhere from frequent attendance at religious ceremonies to painful or frightening initiation rites. Such

96   signals should give adherents a sense of confidence that only those who are fully committed to the

97   religious group's values and ideals will undertake them, thus increasing the chances that anyone

98   displaying such signals, whether personally known to the individual or not (Bulbulia 2009), can be trusted

99   to cooperate.

100

101   Second, cooperation within groups is generally enhanced when institutions are in place for monitoring

102   members for transgressions and for sanctioning those who break the rules (Boyd and Richerson 1992;

103   Mathew and Boyd 2011). However, these institutions themselves require the investment of member

104   resources and are therefore also vulnerable to cheating. Many religions posit the existence of morally

105   concerned supernatural entities and several researchers have proposed that beliefs in such beings are

106   capable of overcoming this second order public goods problem (Atkinson and Bourrata 2011; Johnson

107   2005; Johnson and Krüger 2004; Rossano 2007). When adherents sincerely believe that their actions are

108   constantly being watched by entities capable of imposing sanctions for transgressions, then two essential

109   governance functions, monitoring and sanctioning, are essentially obtained without cost.

110

111   While on the surface it may seem risky to leave such important tasks to beings whose existence is

112   uncertain, or at least unobservable, studies have shown that subconsciously priming individuals, even

113   avowed atheists, with religious words can lead to greater cooperation in economics games (Shariff and

114   Norenzayan 2007). Moreover, a number of scholars have found correlations between the belief in

115   moralizing high gods and a number of proxies for cooperation such as society size, subsistence

116   complexity, and jurisdictional hierarchies (Johnson 2005; Peoples and Marlowe 2012; Roes and Raymond

117   2003; Snarey 1996). Even suggesting the presence of a ghost in a testing room has been shown to reduce

118   cheating by test subjects on competitive tasks (Bering et al. 2005). While this work is highly suggestive,

119   almost all of this research has been done either in laboratory settings or through the use of proxy measures

120   of cooperativity. We know of no study that has looked at the role of supernaturally-based governance

121   within the context of groups working to solve real-world cooperative problems. An exploration of how

122   religion is activated in CBRM, then, provides an opportunity not only to better understand traditional

123   governance systems, but also to explore religion's ability to facilitate cooperation in real-world settings.

124

125

126   3)   METHODS

127   (a) Methodology

128   The methodology we employ to address our research questions is a meta-analysis of case studies (Geist

129   and Lambin 2002; Young et al. 2006; Rudel 2008). This term has frequently been used to describe the

130   analysis of a collection of statistical analyses, but in our case it refers to the analysis of a collection of

131   case studies of CBRM. Meta-analyses of this type are a well-established method for producing synthetic

132   findings from a set of cases, the original analysis of which used disparate data collection protocols (see

133   Poteete et al. 2010). They do not require that data be collected in an identical fashion in order to be

134   compared, but instead rely on standard coding protocols utilizing mostly nominal, ordinal, interval and

135   qualitative variable definitions to create a database which uses existing information to compare across

136   cases.

137

138   This methodology distinguishes between "cases" and "studies." A study, for our purposes, is a published

139   piece or work (e.g. book, book chapter, journal article) that describes one or more cases in depth. A study

140   is our unit of observation, or the unit on which we collect our data. A case, meanwhile, is our unit of

141   analysis. We coded a total of 47 peer-reviewed studies which led to 48 cases of CBRM being coded, as

142   one study provided sufficient information to code for two cases.

143

144   In this project, we examine studies that evaluate the role that religion plays in accomplishing important

145   community-level natural resource governance functions. Two methods were used to populate the list of

146   studies analyzed in this project. The first method involved conducting searches in standard academic

147   databases and relevant journals, as well as in the library at the Workshop in Political Theory and Policy

148   Analysis at Indiana University. The second method involved a snowball procedure, whereby studies

149   analyzed in the first step were used to find other studies that referenced them or were referenced by them.

150   To be considered for analysis, a study must describe one or more cases. Our criteria for and definition of a

151 case is that it consists of one or more geographically proximate communities that: (1) manage the same

152 type of resource and (2) that have similar enough religious beliefs and associated natural resource

153 management strategies to enable their analysis as a single system.

154 <div style="text-align:center">(b) Data recording and measurement</div>

155 There were two primary methods that were used to decide what variables should be operationalized in this

156 study. First, prominent variables were selected from the CBRM literature. The central criterion for

157 inclusion was the plausibility that a variable might be endogenous to religious practices. The second

158 method was based on reading the studies themselves, inductively deriving new variables that appeared

159 across several cases. When a new variable was produced in this way, each study that had already been

160 coded was re-examined with this new variable explicitly in mind.

161

162 The data collection phase of a meta-analysis involves conducting content analyses of studies in order to

163 produce data on a set of cases. This coding process is guided by a coding manual that describes the

164 relevant theoretical background for the project and how to operationalize each variable in the database.

165 Data coding was conducted using the content analysis software package NVivo. Prior to the main coding

166 phase, the project involved a period in which we developed the NVivo file (containing the variables to be

167 coded and the project data) and a coding manual to assist in the coding process. The coding process itself

168 involved two steps for each case. First, each member of the project team (all the authors of the paper)

169 coded a case individually. This process involved reading through a study and "highlighting" the sections

170 that correspond to particular variables. Following this, the coder would systematically code particular

171 values for each of the relevant variables, based on the highlights of text that had been excerpted from the

172 study. The second step in the procedure involved a comparison of the codes entered by each coder.

173 Meetings were held to resolve differences in interpretation. This process helped to minimize concerns of

174 inter-coder reliability, which is a standard issue in content analysis (Neuendorf 2002).

175

176 Table 1 presents a summary of each of the variables we analyzed. The default value for each variable in a

177 case, if no coding inference is made, is "Not enough information provided." This default value helped

178 avoid any unwarranted inferences about the absence of a governance function if an author simply

179 neglected to mention it. The variables could take on three additional values, which were: "Yes, secular",

180 "Yes, religious", and "Yes, both" depending whether secular, religious or both means were used to

181 implement a particular governance function.

182

183   TABLE 1 HERE

184

185 In distinguishing between secular and religious means of implementation, we relied on the following

186 criterion: A governance function is implemented by religion if there is an explicit appeal made to a

187 supernatural, non-human authority that has the power to affect human actors in ways that are beyond the

188 full understanding of those actors. Alternatively, a governance function is implemented in a secular

189 fashion when the authority behind it is understood as deriving from other human actors.

190   4) RESULTS

191 We begin our discussion by describing the data that were produced. We coded a total of 48 cases from 47

192 studies. Table 2 shows the distribution of cases by what we referred to as the "Sacred focus" or the natural

193 phenomenon that was subject to both governance and religious attention. By far the most common sacred

194 focus in the literature was forests, frequently described as "sacred groves." In terms of the geographic

195 distribution of cases across continents, Africa had the most (21), followed by Asia (19), Oceania, (5),

196 North America (2) and Australia (1). The countries with the most cases were India (10), Indonesia (5),

197 and China and Zimbabwe (4 each).

198

199   TABLE 2 HERE

200

201 Table 3 shows the presence of each of the variables across the 48 cases. The second column ("Yes,

202 religious") shows the absolute number of cases in which religious means were used to implement a

203 governance function. Following this, the third column shows the percentage of the cases out of the total

204 48 that did so. Finally, the fourth column shows the percentage of cases that coded "Yes religious" out of

205 those that provided enough information about the governance function to warrant a non-default code (did

206 not have "not enough information" coded). In the ensuing discussion we refer to cases that provided

207 enough information to warrant coding of any kind other than the default "Not enough information" as

208 "informative cases."

209

210   TABLE 3 HERE

211

212 Examining these data reveals a wide variability in the extent to which the governance functions were

213 described as being implemented by religious means. The most frequently implemented were

214 appropriation (88%), sanctions (81%), social capital (77%), resource boundaries (75%), leadership (67%),

215 and benefits (60%). After these prominent variables there is a substantial drop-off to user boundaries

216 (41%) and social monitoring (31%), with the remainder of the functions being mentioned infrequently.

217

218 The final column of table 3 complicates this picture slightly and its inclusion reflects an issue that we

219 faced throughout our analysis. Namely, we cannot automatically infer from an author not mentioning a

220 governance function that in fact it was not present or that religion did not have a role in its

221 implementation. This is a general qualification of all of our results. The data in the final column

222 strengthens the evidence that religion could play an important role in implementing several governance

223 functions, most notably for "Proportionality," that otherwise would have only weak evidence supporting

224 the role of religion in their implementation.

225

226   5)   DISCUSSION OF SPECIFIC GOVERNANCE FUNCTIONS

227   In this section we discuss each of the governance functions in turn. We have arranged this discussion

228   based on the order of the functions as presented in table 3, starting with those variables that were just

229   mentioned as figuring prominently in the data. We follow this with a broader discussion of the less

230   prevalent variables (local conditions, proportionality, collective-choice, resource monitoring, conflict

231   resolution, local autonomy, and nesting).

232   (a)   User boundaries

233   User boundaries indicate the presence of enforced rules that distinguish between who is a member of a

234   user group and who is not. Such rules are important because membership generally is accompanied by

235   rights to access a CPR. Limiting membership is thus one of the primary ways to avoid excessive pressure

236   on a natural resource. Additionally, well-defined social boundaries can contribute to the emergence and

237   endurance of norms of reciprocity and trust among community members (Gibson and Koontz 1998). User

238   boundaries were reported to be implemented by religious means in 42% of all cases, and 77% of

239   informative cases.

240

241   In the analysis we found that religion mediated the implementation of social boundaries in three ways.

242   First, religion can give the authority to key persons in the communities (e.g., leaders, priests, shamans,

243   secret societies, elders) so they draw the lines distinguishing different groups within the community. This

244   was the most common method of religious influence among the cases where religion mediated the

245   implementation of social boundaries. Second, religion can give additional significance to pre-existing

246   group characteristics upon which social boundaries are ultimately drawn (e.g., castes, gender, or family

247   and clan membership). For example, a religion might forbid women or men from accessing a particular

248   part of a natural resource, or only allow elders to enter. A notable number of the cases where religion

249   mediated the implementation of social boundaries fell into this category.

250

251 Finally, religious rituals are used as a barrier to entry, separating those who perform required rituals and

252 thus have access to the resource from those who do not. A significant number of the cases where religion

253 is important for social boundaries fell into this type. For example, two irrigation systems in Izucar,

254 Mexico are traditionally divided up into wards, each of which is dedicated to a saint whom farmers serve

255 in exchange of their right to use the water. "They are bound to serve him or her, for example, by

256 contributing to religious banquets, masses and processions and to the maintenance of the church"

257 (Nederlof and Van Wayjen 1996, 77).

258   (b) Resource boundaries

259 According to theory, the existence of well understood physical boundaries that separate a resource from

260 the larger biophysical environment plays a similar role as user boundaries in that it helps assure that there

261 is a close relationship between a set of users and a particular resource. Without this, even with well-

262 established user boundaries, it might not be clear who can access which resources, which can lead to

263 negative externalities and resource deterioration. Resource boundaries were one of the most frequently

264 reported governance functions, with 75% of all cases and 88% of informative cases reporting religious

265 implementation.

266

267 To assess the influence of religion on the existence of resource boundaries we recorded information on

268 the existence of religious markings and/or a common understanding among users of the boundaries of

269 sacred resources. The great majority of the studies where religion played a role in delineating resource

270 boundaries reported the presence of natural and hand-made markings of religious significance. These

271 included both natural and artificial phenomena including sacred stones, caves, hills and peaks of

272 mountains, to monoliths, burial grounds, shrines, palaces, monasteries and temples. Tengo et al. (2007)

273 provide an example of such markings in the Androi region of Southern Madagascar, an arid region

274 populated by a group known as the Tandroy: "Trees, especially Alluaudia procera and Moeringia sp., are

275 planted around tombs, and the taboo forests are often surrounded by a margin of cacti, Opuntia ficus-

276 indica" (687). In a number of these cases, the sacredness of the resource and thus its boundaries were

277 contingent on the presence of other resources. That was the case, for example, in a number of forests

278 where the boundaries were defined along sacred streams or by the presence of waterholes, plant species,

279 or animals like lions and monkeys.

280   (c) Appropriation

281 The existence of clear resource boundaries and a clear understanding of who can and who cannot

282 appropriate a resource do not necessarily prevent those who do have access from overexploiting it. One

283 way to accomplish this is the design and enforcement of appropriation rules that prescribe the method,

284 timing, and extent of resource extraction. That appropriation rules constitute a critical aspect of natural

285 resource management, and that religion is highly amenable to their implementation, is shown by the 88%

286 of all cases and 91% of informative cases that reported such implementation.

287

288 Some of the most common appropriation rules that were implemented through religious authority concern

289 restrictions on the harvesting or use of specific resources and in certain locations. This was most frequent

290 in forest cases, where appropriation rules apply to specific forest areas and products like sacred plants,

291 animals, and specific tree species. For example, in the traditions of the Shona people of the Choa

292 highlands of Mozambique, "cutting of live trees or branches, setting fires and opening fields are

293 forbidden. On the other hand collecting dead wood, fruits and mushrooms, and even grazing cattle are

294 allowed except in the most sacred core area where the ceremonies are held" (Virtanen 2002, 232).

295

296 Religiously-mediated restrictions on specific types of use were also frequent including, for example,

297 prohibitions of littering or farming in sacred forests, or bathing in sacred rivers. A number of cases also

298 reported religiously-mediated rules regulating the timing of the use, particularly in fishery cases. In these

299 cases harvesting or hunting activities can only be carried during specific seasons that are marked by

300   religious calendars, often opened and closed through the celebration of important religious ceremonies.

301   For example, in the Binh Thuan Province of Viet Nam, fishing communities following the van chai

302   tradition hold festivals for the Sea Gods five times per year, including a " 'Spring festival' (2nd month), a

303   'Summer Festival'(4th month) to mark the beginning of the Southwest Monsoon or main fishing season, a

304   'Autumn Festival' (6th month), a 'Praying for Fish Festival' (7th month); and a 'Close of the Southwest

305   Monsoon Fishing or Transition Season (8th month)" (Ruddle 1998, 11). Interestingly, we did not find

306   appropriation rules constraining the type of technology that were implemented through religious

307   authority.

308   (d) Social monitoring

309   Social monitoring in this context indicates whether or not the extractive activities of resource users are

310   observed by others. This is quite important in dissuading those members of the community who might

311   otherwise appropriate excessive amounts of the resource from a group perspective. As can be seen in

312   table 3, religion was coded as playing a role in social monitoring for only 31% of all cases. For a variety

313   of reasons we believe this is an underestimate. First, social monitoring of any kind was only mentioned in

314   a total of 19 cases. It may be, then, that researchers in the literature we examined are overlooking this

315   important governance function in their analyses. The fact that religion played a role in 83% of informative

316   cases suggests that monitoring may be a very important role for religion to play in CBRM, but more

317   research will be required to establish the extent to which this is the case.

318

319   Second, as will be discussed more below, religion played a significant role in sanctioning. It is hard to

320   imagine how sanctions could be meted out without some method in place to monitor transgressions.

321   When religion is employed to deliver sanctions it is not unreasonable to assume that at least in some cases

322   it is employed in monitoring as well. Finally, it is plausible that the ways other governance functions are

323   implemented help to facilitate social monitoring. For instance, it was not uncommon to require animal

324   sacrifices or other religious rituals before extracting resources from sacred forests. Presumably, such

325 ceremonies are public affairs and, if so, it would be easy to know if someone was in the forest without

326 authorization if no sacrifice had been performed. Unfortunately, we simply do not have enough

327 information at this point to know how religiously implemented governance functions may support one

328 another.

329

330 Religious social monitoring took a variety of forms. In some cases, religious leaders such as priests or

331 monks actively patrolled the resource in question. In other cases, community members were expected to

332 report transgressions to religious authorities. In the majority of cases, however, users believed that the

333 resource in question was populated with supernatural entities such as ancestral spirits who watched for

334 moral transgressions. For example, among the Kodi on the island of Sumba in Indonesia:

335

336 "Ancestors have the power to control environmental processes such as rainfall patterns and crop yields.

337 But they are particularly interested in those natural resources that are sacred. The ancestors monitor and

338 direct the ways that Kodi people use sacred resources" (Fowler 2003, 309).

339   (e) Sanctions

340 Sanctions are a function that naturally accompanies monitoring and are frequently what give monitoring

341 its force. They are critically important in altering the informal cost-benefit calculus that actors make when

342 deciding whether or not to break community rules. They do so by raising the expected costs of breaking

343 these rules which, if high enough, overcome the expected benefits of doing so. As can be seen in table 3,

344 religion clearly played an important role in sanctioning, being coded as important in 81% of all cases and

345 95% of informative cases.

346 These sanctions took many different forms. In some instances, religious leaders were responsible for

347 determining monetary fines. In other systems, violations had to be atoned for through sacrifices to

348 supernatural entities. Most common, however, was the belief that the supernatural entities mentioned

349 above who inhabit the resource in question were capable of delivering retribution against those who broke

350 the rules. In Mongolia, for example:

351

352 "Special places found in a pristine natural state and rare animals and plants were labeled 'vicious place'.

353 It was strictly prohibited to alter the land, chop trees or plants, or hunt in these places. People believed

354 from their childhood that violation of these rules would make the Lord of Land and Water furious —

355 bringing misfortune, disease and bad luck to all" (Urtnasan 2003, 97).

356

357 Interestingly, supernatural sanctions were often described by authors in ways that suggested that penalties

358 were graduated, with more serious transgressions being punished more severely. When we coded

359 sanctions, we differentiated between those where the perceived consequences were material, such as

360 sacrificing a valuable animal or becoming sick, and those where the consequences were immaterial, such

361 as social shunning or incurring bad luck. Three of the cases in which religion played a role in sanctioning

362 had insufficient information for us to make this determination. Of the remaining 36 cases, all included

363 some form of material consequence and 18 employed both material and immaterial sanctions.

364   (f) Benefits

365 Like sanctions, providing benefits alters the cost-benefit calculus of participants, but it does so by raising

366 the benefits of cooperation instead of raising the costs of non-cooperation. In coding this variable, we

367 excluded benefits that accrue to users as a direct result of their appropriation and/or consumption of the

368 resource. Instead, we were interested in less direct benefits that might provide additional motivations for

369 participants to cooperate with others to sustain a resource. The evidence for the role of religion in

370 implementing this function is fairly strong: 60% of all cases and 88% of informative cases reported such

371 implementation.

372

373   Like sanctions, a distinction was made in the coding phase between benefits that were material and non-

374   material. Out of all of the cases that reported the presence of religiously-mediated benefits, every one of

375   these included material benefits, while some cases explicitly combined both material and non-material

376   benefits. For example, Barber and Jackson (2010, 28) describe the spiritual and physical importance of

377   certain trees as perceived by the Junggayi people of Nigeria:

378

379   "The Junggayi often stroke or pat trees representing people and may rub them with mud as part of the

380   procedure of asking for plenty and to ensure fertility of the locality."

381

382   The most common material benefit reported was rain, and this was frequently accompanied by the

383   mention of the good harvests that this would presumably bring. Not surprisingly, many of the benefits

384   were simply the inversion of one of the observed sanctions. For example, it was common for users to

385   believe that certain objects associated with natural resources (springs, herbs) could cure disease and

386   remove curses.

387   (g) Leadership

388   Leadership is a very common variable in the CBRM literature. The vast majority of communities that

389   manage natural resources do so in part through the diversification of roles held by participants. This

390   diversification generally grants some participants additional levels of authority with respect to the natural

391   resource and the activities of other participants with respect to this resource. Leadership is somewhat

392   different from many of the other governance functions that have been discussed here in that it is not

393   exactly a function itself. Rather, it is a condition that facilitates the implementation of other governance

394   functions. If a religious leader played an important role in a governance function we were analyzing, then

395   we would code both leadership as well as that governance function as being present in that case. Religion

396   played a role in creating leadership positions in 67% of all cases and 82% of informative cases,

397 respectively, providing strong evidence for the importance of religion in implementing this governance

398 function.

399

400 The role that religion plays with respect to leadership is the provision of (religious) authority to the leader,

401 who in turn accomplishes important governance tasks. These religious leaders were commonly referred to

402 as healers, priests, shamans, and a variety of terms specific to frequently unnamed local belief systems. In

403 addition to playing a strong role in the general management of a natural resource, the most prominent

404 functions that the leaders played included: (1) conducting rituals, frequently to derive important social

405 benefits (2) communicating on behalf of their communities with supernatural entities that themselves

406 were believed to have some authority with respect to a natural resource. For example, Khumbongmayum

407 et al. (2005, 1578) describe the importance of leaders in conducting rituals to appease Gods that reside in

408 sacred groves in Manipur, India:

409

410 "'Lai Harouba', celebrated in honour of the sylvan deities (Umanglais) residing in sacred groves is still

411 performed in most of the sacred groves. The objectives of the 'Lai Haraoba' are to please deities by

412 performing traditional rituals especially performed by the Maiba (priest man) and Maibi (priest woman)

413 in order to gain their favour."

414   (h) Social capital

415 High levels of social capital can greatly aid a user group in maintaining cooperation and thus preserving a

416 natural resource. It does so by lowering the need for, and costs associated with, the other governance

417 functions that we have described here. If individuals have high levels of trust and reciprocity, then they

418 expect (ideally correctly), that there will be little rule-breaking. Conversely, with low levels of trust and

419 reciprocity, individuals must constantly be on guard against expected rule-breaking. As such, social

420 capital plays a similar, but slightly different role than leadership does with respect to natural resource

421 management: it can help the implementation of other governance functions; although in many cases it

422   obviates much of the need for these same functions. After appropriation and sanctions, the evidence for

423   the role of religion in implementing this function was the strongest out of all the variables we analyzed:

424   77% of all cases and 95% of informative cases reported that that religion helps to implement this function.

425

426   One common, and the most explicit, way in which religion played a role in building social capital with

427   respect to natural resource management occurred when natural resources played a role as sacred sites

428   where religious rituals took place. Such occurrences created a tight connection between the preservation

429   of the natural resource and the maintenance of social bonds. For example, Dorm-Adzobu and Veit (1991,

430   13) describe how rituals increase reverence for a forest known as the Malshegu sacred grove in northern

431   Ghana:

432

433   "Offerings of food, chicken, guinea fowl, and goats are made by families to their compound gods. The

434   spirit of the animal is released by sacrificially cutting its throat and ceremonially pouring and smearing

435   the blood on the cone. Such practices strengthen local beliefs in the traditional religion and add to the

436   reverence afforded to the Kpalevorgu god and its grove."

437

438   Another common way in which religion implemented social capital was less direct; in many cases

439   religion served as a means for resource users to gather in a context (e.g. in a church) not necessarily

440   explicitly oriented around natural resource issues. Based on the literature and our own experience

441   working with resource user communities, we believe that it is reasonable to infer that in many such

442   instances not only are important social bonds created and formed in such settings, but many informal

443   conversations that are quite pertinent to natural resource management occur. Additionally, such activities

444   can act as costly signals as discussed earlier, thereby increasing trust among members. So, while this type

445   of social capital building does not provide incentives to preserve natural resources as directly as sacred

446   rituals within such resources do, it nevertheless can play a very important role in resource management.

447   (i)   Other variables

448   The data for the remaining governance variables (congruence with local conditions, proportionality,

449   collective-choice, resource monitoring, conflict resolution, local autonomy and nesting) are difficult to

450   interpret. Mostly, we did not obtain enough information for these variables to draw any strong

451   conclusions, once again leading us to believe that although these variables are commonly discussed in the

452   CBRM literature, they are either not commonly implemented religiously or are not routinely analyzed by

453   researchers working in the field of traditional resource management. This latter possibility seems

454   especially likely for conflict resolution, mentioned in only 12 cases, congruence with local conditions,

455   mentioned in only three cases, and proportionality, mentioned in only four cases.

456

457   In comparison with the other governance functions, we did not expect religion to play a particularly

458   strong role in either providing local autonomy or in institutional nesting. Given the local focus of the

459   cases, it is unlikely that authors would comment on state-level details that might enable coding these

460   variables. Moreover, the recognition of the rights of local users to decide rules and to coordinate the

461   relationships between groups is necessarily a function of authority external to any individual group in

462   question. Most often, these institutions are embedded within regional or national governments, many of

463   which derive power through secular authority. Nevertheless, we did find four cases in which religious

464   authority played at least some role in ensuring local autonomy and two cases in which religious authority

465   played some role in nesting.

466

467   We also did not expect religion to play a comparatively strong role in resource monitoring. Relative to

468   other governance functions, monitoring the physical state of a resource system seems like a mundane and

469   rather concrete task that might best be served through secular institutional arrangements. It was therefore

470   surprising that of the four cases for which we could infer some system in place for resource monitoring,

471   all of them derived from religious authority.

472

473   Finally, the dearth of data relevant to collective-choice arrangements may be an artifact of the way we

474   operationalized this variable. Whether secular or religious, we only coded "yes" for this governance

475   function if we could infer the presence of some form of direct, democratic decision-making by local users

476   to determine rules in use. Such democratic systems seemed relatively rare among the cases we examined.

477   Instead, the authors of many cases discussed other institutional arrangements by which rules were

478   determined at the local level. For instance, it was not uncommon for rules to be decided by a local leader

479   or by a council of elders. By our definition, though, these were not coded as collective-choice

480   arrangements. That some traditionally managed resource systems have persisted sustainably, often for

481   centuries, in the absence of collective-choice arrangements as defined in our study suggests that what may

482   be more important than democratic or other similar representational systems is simply that users feel the

483   rules, however they may be decided, derive from legitimate authority and that they are applied fairly.

484   Unfortunately, the studies we used were not sufficiently detailed for us to infer whether users in any

485   particular case felt that the rules were legitimately produced.

6) CONCLUSIONS

487   We need to qualify the interpretation of our findings by observing once more that they are as much a

488   result of the theoretical focus and idiosyncratic interests of the authors as they are the facts of the cases

489   those studies describe. To the extent that this biases our results, in this case it would probably lead us to

490   underestimate the importance of religion in natural resource management. This bias would occur if

491   authors did not mention important functions that were in fact present in their cases, which presumably can

492   happen whenever that particular function is not a part of the theoretical focus of the author. The reverse,

493   where an author misleadingly reports on the presence of a governance function, seems much less likely.

494

495   This qualification aside, we believe our analysis shows that religion clearly plays an important role in

496   CBRM. Out of the 15 governance functions that we examined, religion played an important role in at

497   least eight of them. These findings are relevant for both the literature on CBRM and the debate over the

498   role that religion might play in human societies as discussed in section two. With respect to CBRM, these

499   findings reinforce previous arguments that have been made in favor of the importance of local institutions

500   and culture. When these beliefs and traditional practices are upheld, they increase user buy-in and can

501   lower the transactions costs involved when such systems become self-enforcing. Unfortunately, these

502   types of systems can be crowded out by external influences. Indeed, an aspect of our data that we did not

503   emphasize in this paper indicates that in many of the cases we examined this has been occurring. Many of

504   the systems discussed here have shown signs of deterioration, socially or ecologically.

505

506   As such, this analysis supports the principle that resource management and development efforts will be

507   aided by an understanding of the local context in which they are applied, as well as the evolutionary

508   history specific to that context. Too often environment and development policies have been guided by a

509   view of human nature that only values material costs and benefits. The result of this is that our evolved

510   capacities for self-enforcing, self-reinforcing cooperative behaviors are insufficiently leveraged or, even

511   worse, may be crowded out by external incentives.

512

513   Our results also have an important implication for how religion is viewed across different disciplines. As

514   mentioned earlier, religion is frequently viewed as an anachronism or as a kind of irrational nuisance in

515   the face of modern scientific knowledge. Our results show, perhaps unsurprisingly, that this interpretation

516   is overly simplistic and that religion can have an important adaptive function. Like any rather vague and

517   abstract noun, the possible roles and actual effects that religion can have are quite manifold.

518

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Table 1: Variable descriptions

Variable	Type	Description
User boundaries	Institutional	Clear boundaries between legitimate users and non-users must be clearly defined.
Resource boundaries	Resource	Clear boundaries are present that define a resource system and separate it from the larger biophysical environment.
Congruence with local conditions	Institutional/ Resource	Appropriation and provision rules are congruent with local social and environmental conditions.
Proportionality	Institutional	The benefits obtained by users from a CPR are proportional to the amount of inputs required in the form of labor, material, or money.
Collective-choice arrangements	Institutional	Most individuals affected by the operational rules can participate in modifying the operational rules.
Social monitoring	Institutional	Monitors monitor the appropriation and provision levels of the users.
Resource monitoring	Institutional	Monitors monitor the condition of the resource.
Sanctions	Institutional	Appropriators who violate resource governance rules are likely to be assessed sanctions.
Conflict-resolution mechanisms	Institutional	Appropriators and their officials have access to low-cost local arenas to resolve conflicts among resource users.
Local autonomy	Institutional	The rights of resource users to devise their own institutions are not challenged by external governmental authorities.
Nested enterprises	Institutional	Essential governance activities are organized in multiple layers of nested enterprises.
Appropriation	Institutional	Rules exist regarding the appropriation of the natural resource and the specific means by which appropriation is constrained.
Benefits	Institutional	Benefits are provided to resources users other than those material benefits that are obtained through the normal use of the resource.
Leadership	Group	Leadership positions with authority regarding natural resource use and governance are present.
Social capital	Group	Strong social capital among resource users exists that facilitates effective resource management.

Table 2: Sacred focus of cases

Sacred focus	Cases
Forest	31
Water	4
Fisheries	3
Wildlife	3
Mountain	2
Multiple	2
Farmland	1
Valleys	1
Wetlands	1
Total	48

Table 3: Main results

Governance function	Yes, Religious	%Yes, Religious/ total cases	%Yes, Religious/ informative cases
User boundaries	20	42%	77%
Resource boundaries	36	75%	88%
Congruence with local conditions	1	2%	33%
Proportionality	4	8%	100%
Collective-choice arrangements	3	6%	30%
Social monitoring	15	31%	83%
Resource monitoring	2	4%	40%
Sanctions	39	81%	95%
Conflict resolution mechanisms	5	10%	42%
Local autonomy	2	4%	14%
Nested enterprises	2	4%	50%
Appropriation	42	88%	91%
Benefits	29	60%	88%
Leadership	32	67%	82%
Social capital	37	77%	95%