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FORMAL EPISTEMOLOGY IN A TROPICAL SAVANNA

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Introduction

As a philosopher who also practices ecology and has a small laboratory, conservation biology and disease epidemiology have been two areas that have afforded opportunities for testing the relevance of philosophical methods in the field, particularly decision theory as reconstructed within formal epistemology. What follows is the story of one such episode, an attempt to use decision analysis to support a complex multi-criteria, multi-agent decision to be made concerning land use in a remote region of Indonesia. This example shows both the promise of these methods and the practical difficulties faced in their attempted application.

I begin with some personal remarks explaining my involvement in this project. In 2003, when Branden Fitelson and I began organizing the Formal Epistemology Workshops (FEW), our initial concern was mainly with reinvigorating formal work in fields such as confirmation and theory choice which had once concerned key figures such as Keynes, Ramsey, Carnap, Reichenbach, and others but had come to be neglected in the recent philosophy of science.

As we worked to develop formal epistemology, I initially felt a tension between its embrace of abstract examples divorced from science in practice and the work that my laboratory did. We were involved in applied work in disease ecology and conservation science. In both cases we worked extensively in field-based projects that involved working with local communities with multiple stakeholders. However, it soon became apparent that, beyond purely ecological scientific analysis, we were necessarily placing ourselves in policy contexts through our work, where the best feasible choice had to be made between feasible but imperfect alternatives.

Consequently, we began to see that our work was essentially falling within the domain of decision analysis—that part of formal epistemology that deals with the rationality of choice and action. As will be seen below, we were dealing with particularly complex decision problems, sometimes technically termed "wicked problems," because even the problem formulation is open to dispute. For conservation problems, we developed a framework that relied heavily on multi-criteria analysis. The example below discusses a case where this theoretical framework was translated into practice. For us, this experience has demonstrated the mutual value of interaction between philosophical theory and practical policy, but it has also led to a cautionary strategic attitude about developing collaborative partnerships with actors from outside academia, in particular with large non-governmental organizations (NGOs) and corporations.

Background

To start at the origins of my interest in biodiversity and conservation science: when conservation biology first emerged as an organized discipline in the United States in the late 1980s, two publications were particularly important for many of us who had long been politically involved in attempts to conserve biodiversity. The first was Michael Soulé's manifesto "What is conservation biology?," which appeared in *BioScience* (Soulé 1985) a few months after the founding of the Society for Conservation Biology (Soulé 1987). The second was Dan Janzen's exhortation to ecologists, "The future of tropical ecology" (Janzen 1986). Janzen's rhetoric was powerful. In Costa Rica, where he mostly worked, as well as elsewhere in the tropics, he witnessed natural habitats disappearing under pressure from powerful socio-economic forces. If biologists wanted to continue having tropical nature to "biologize" about, Janzen argued, they must undertake the political activism necessary for conservation. They must do so by embedding themselves and propagating their conservationist imperative within local cultures. There was no alternative. It was a demanding and compelling vision.

To a philosophy graduate student, as I then was, the contrast between Janzen's and Soulé's pieces could not have been greater. Soulé, like Janzen, also conveyed a sense of urgency by declaring conservation biology to be a "crisis discipline," but he then proceeded with great pomp to produce hyper-theoretical "postulates." He had two types of postulates, functional ones describing the state of the world and normative ones explicating an ethic of conservation. The functional postulates were relatively innocuous claims about ecology, how co-evolution has taken place, how ecological processes may enter chaotical, dynamical regimes beyond some parameter values, and so on. None were either very original or controversial. What held my attention were Soulé's normative postulates. Though Soulé invoked the hallowed name of the philosopher Arne Naess, who had once been part of the Vienna Circle, his normative postulates were *ex cathedra* pronouncements with little supporting argument.

Ecological complexity is good, Soulé declared. So is evolution. But, I remember wondering, evolution consisted of three main processes: adaptation, diversification, and extinction. If evolution is good, presumably all these processes should also be good. But wouldn't finding extinction good be awkward within a conservationist ethic? Unless, perhaps, extinction was supposed to pave the road for further evolution. From Soulé's account, there was no way to tell: there was no further discussion. More controversially, Soulé simply announced that biological diversity had intrinsic value. He did not even seem to understand that, here, he was treading into well-worked and controversial philosophical territory, and that claims like this should not be made without adequate defense. Perhaps even more troubling was that Soulé's ethic had no place for human values and interests. Like most other Northern conservation biologists of that decade, he harped on the biodiversity that was at risk in the global South. But he did not once acknowledge a need to engage those Southern populations that would bear the brunt of his proposed policy measures.

In contrast to Janzen's inclusive vision, Soulé's normative program was imbued by the values of just one faction of North American environmentalism. This faction styled itself *deep ecology*, with the honorific "deep" presumably intended to indicate that adherents were privy to some profound insights inaccessible to ordinary ecologists and environmentalists who were concerned, e.g., with resource depletion or pollution. Deep ecologists often gloated on their distaste for human values and interests, putting what they regarded as Nature above mere humans. In 1989, this ideology was subjected to a blistering attack—"Radical American environmentalism and wilderness preservation: A Third World critique"—by Ramachandra Guha, an Indian anthropologist visiting the Yale School of Forestry and Environmental Studies. In my assessment, very little of Soulé's conservationist ethic survived Guha's attack, which became one of the most anthologized contributions in the emerging discipline of environmental philosophy. My rejection of Soulé's vision of conservation biology paved the way to eventually viewing conservation problems as decision problems rather than ecological problems.

Zum Wissenschaftskolleg

Even though I taught, at McGill University in 1995, what was one of the earliest undergraduate courses in the philosophy of conservation biology, I did not anticipate doing work in conservation biology. However, biodiversity protection remained a guiding political goal in my environmental activism from that period. That changed when I spent the 1996–1997 academic year at the *Wissenschaftskolleg zu Berlin* (WiKo for short). The Kolleg encouraged free-ranging discussion and collaboration among its Fellows and the time spent there was intellectually rewarding. While there were about 40 resident Fellows every year, many others came for shorter periods including those from earlier years. Two

such Fellows who visited WiKo in Spring 1997 were Guha and Chris Margules, then working at the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia. Thanks to their presence I turned from ongoing work on the history of evolutionary genetics to problems of biodiversity conservation.

With Guha's encouragement, I completed a philosophical critique of wilderness preservationism that contrasted it with biodiversity conservation (Sarkar 1999). My interactions with Margules were more significant. During the 1993–1994 academic year at WiKo, Margules had been part of a Working Group, "Biodiversity Reserve Selection Methods," that had brought together experts from Australia, South Africa, and the United Kingdom. Together, this group began to develop a framework for biodiversity conservation that came to be called "systematic conservation planning" (Sarkar and Margules 2014). Margules and Pressey (2000) went on the publish the foundational document for the new approach shortly afterwards.

The central problem of systematic conservation planning was the selection of a set of areas earmarked for biodiversity conservation. Originally, these areas were presumed to be reserves but, as a few of us soon emphasized, reservation is not the only valid approach to conserving biodiversity. Moreover, as the philosophical critics of wilderness preservationism had been pointing out for over a decade, creating reserves was associated in many cases with involuntary displacement of resident peoples. Consequently, the term "conservation area" came to replace "reserve" (Sarkar 2005). Moreover, since it was also recognized that successful conservation required engagement with the entire spatial matrix of the region, and would be futile if restricted only to selected conservation areas, the term "prioritization" came to replace "selection." The prioritization of conservation areas in a landscape or seascape remains central to systematic conservation planning today.

In Berlin, Margules and I realized that conservation area prioritization is a decision problem. We had a set of feasible alternatives, the potential sets of conservation areas. Here, "feasible" means that each such set satisfies constraints such as the total budget for conservation measures. The criterion by which performance was to be measured is the representation of biodiversity features. Because of the large size of the data sets typically required for such decisions (e.g., hundreds of thousands of habitat patches and thousands of species), computer-based methods were needed. These, in turn, required the development and use of software decision support tools. Margules and other Australian researchers, as well as Paul Williams from the Natural History Museum in London, had already begun developing such software but there was much more that could be done. I began to see that my background in decision theory as a philosopher (as well as experience in computer science) could be useful in systematic conservation planning. The context was set for a potentially fruitful interaction between formal epistemology and conservation science in the field.

Decision Support and Algorithmic Area Prioritization

Two years later, I arrived at the University of Texas with the intent of developing and testing protocols for systematic conservation planning. Our first decision support software tool was ResNet which incorporated methods that had been used to identify the ways in which the conservation area network of Québec could be improved (Sarakinos et al. 2001). The recommendations were partly implemented insofar as some of the new areas we prioritized for conservation were designated for that purpose. However, the extent to which our proposals were explicitly used has never been clear to me. The likely scenario is that they were made part of the recommendations developed by The Nature Conservancy, which had provided us with much of our data in return for our results. However, there was no explicit acknowledgment of systematic conservation planning by the Québec authorities.

ResNet was originally developed jointly with Anshu Aggarwal who had worked with me at Boston University in the early 1990s and had continued to help in software development for various research projects. In Texas, Justin Garson, a philosophy graduate student, was responsible for many extensions and revisions. Garson also worked on developing a suite of other software decision tools for biodiversity conservation (Sarkar et al. 2005). Another philosophy graduate student, Chris Pappas, made further improvements to these decision tools. Trevon Fuller, who began as a philosophy graduate student but later switched to biology, developed software to optimize spatial connectivity between conservation areas (Fuller and Sarkar 2006).

Meanwhile, Margules and I continued our collaboration to write the first textbook of systematic conservation planning (Margules and Sarkar 2007). Our methods were adopted and used by the laboratory of Victor Sánchez-Cordero at the Instituto de Biología of the Universidad Nacional Autónoma de México (UNAM). Around this time Margules left CSIRO to head the Asia-Pacific Division of Conservation International (CI), which led to the possibility that our methodologies would find use in optimizing conservation decisions in the field, something that had, at best, only been partly achieved in Québec. The planning exercises in México as well as the CI-sponsored one from Indonesia (the case study of this chapter) are important because they provide feedback from explicit attempts at using philosophically-based decision theory in practical conservation contexts.

Values and Multiple Criteria

The software decision support tools that we and others were developing implemented algorithms to solve complex computational problems. As I have pointed out elsewhere (Sarkar 2012a), much of the theoretical work in this part of conservation biology at the time consisted of algorithm design. In the 1990s, the

algorithms that had been developed by conservation biologists were largely restricted to attempts to identify the smallest possible area for conservation that would ensure adequate protection for biodiversity. There were two versions of this problem. Both required that quantitative targets be set for each biodiversity feature such as species or ecosystem to be conserved. The first "minimum area" problem asks that all such features be included, up to their targets, in a set of conservation areas in as small a prioritized area as possible. The second "maximum representation" problem asks that as much of the features (up to their targets) be included as possible within a fixed budget constraint. It turned out that the first problem was much easier to solve than the second. ResNet resolved typical data sets in a matter of seconds, as did many other decision support tools for systematic conservation planning (including C-Plan, Marxan, Target, and WorldMap).

Between 1999 and 2010, I routinely taught systematic conservation planning both in Integrative Biology and in environmental philosophy courses at the University of Texas. In these classes, the conceptual framework as well as the methodologies of systematic conservation planning were subjected to relentless philosophical scrutiny. This attention led to three interesting innovations in how we conceived of the methodology of systematic conservation planning. First, students were fast to point out that quantitative targets for the inclusion of biodiversity features such as species were arbitrary insofar as that they had no credible basis in science. Should 10 percent of the habitat of a species be conserved? Or 15 percent? There was no ecological criterion that decided such choices. (This problem was also used by conservation biologists to criticize systematic conservation planning [e.g., Soulé and Sanjayan 1998].)

Class discussions led to the realization that these targets reflected normative societal judgments about acceptable risk and were very similar to judgments about how to categorize risk for species, namely, when they should be labeled as "endangered," "threatened," and so on. These are normative value judgments—what risk we, as a society, find acceptable and to what extent. Our response in developing software was two-fold. We enabled—and encouraged—the exploration of a variety of possible target sets. We were explicit in noting that the choice of targets should be made through deliberation by stakeholders making conservation decisions. As time went on, I began emphasizing that we were devising decision *support* tools, *not* decision *making* tools. In an introductory text on environmental philosophy that I published at the time (Sarkar 2012b) I tried to bring these conceptual problems to the attention of philosophers. The point that I tried to emphasize is that philosophy of science has much to contribute to the construction of a satisfactory framework for systematic conservation planning.

Second, though we had realized that the maximum representation problem was computationally more complicated than the minimum area problem, we had implicitly thought of them as "conversely" related to each other—in the

mathematical terminology of computer science, as "dual" problems. We now came to realize that this was not the case, because of the ambiguity in the phrase "as much of the features." For instance, should we maximize the number of features that met their target? Or the extent to which all of them met their targets? There was no good reason to treat any one of the formulations as necessarily being the correct one for all contexts. Our software began to offer multiple options. The ResNet family of programs was not sophisticated enough for addressing all these options. A new approach to software was needed, and Pappas was the first to propose that we turn to a new family of metaheuristic algorithms, most notably, tabu search. (Tabu search is a metaheuristic algorithm for optimization.)

The third problem was much more serious; for me, it brought into question much of the work we had been doing in systematic conservation planning, which had originally appealed to me because of my dissatisfaction with Soulé's framework for conservation biology—especially his treatment of normative questions by rejecting human values as irrelevant or illegitimate. Yet, we had not broached these values at all in all the protocols for conservation decisions we had developed. This sense of failure was aggravated by a realization that, if any specialty should be particularly adept at the kind of normative analysis that was being called for, it should be philosophy.

Once again, I turned to the literature on decision theory. By 2002 my laboratory had begun a systematic review of the relevant methodologies that were scattered across the economics, operations research, and philosophical literature, often classified under acronyms such as MCDM (multiple criteria decision making). The problem now was the wide variety of methods that were available. Working with me, a philosophy graduate student published a critical review with recommendations for use by conservation biologists (Moffett and Sarkar 2006). Garson and I developed a protocol in which ResNet would be used to generate a portfolio of scenarios which were all adequate for biodiversity representation. We then subjected these scenarios to multi-criteria analysis using *Dominance*, that is, retaining only non-dominated (or Pareto-optimal) scenarios. When this strategy still left many scenarios as acceptable, we recommended deliberation (Sarkar and Garson 2004; Sarkar 2012b). The philosophical problems raised by complex decisions led me to recommend rational deliberation among stakeholders to the fullest possible extent before the use of formal methods.

With regard to techniques of multi-criteria analysis, Jim Dyer at the University of Texas convinced me that the only reasonable one to use beyond Dominance is multi-attribute value theory (MAVT). This was the only method that was fully consistent with standard utility theory. But its use also required the satisfaction of some subtle conditions on how problems must be formulated. It became clear that trained decision analysts would be needed to advise decision makers in the field. We began large training exercises. Some of the largest were

held at UNAM in Mexico City in 2007 and 2008, and several groups in Mexico became the first to use these methods. Meanwhile, Michael Ciarleglio, an applied mathematics graduate student at the University of Texas, developed ConsNet, a software package based on tabu search that supported multi-criteria decisions (Ciarleglio et al. 2009a). This was the software package that we subsequently used in both Mexico and in the Indonesian case that will be discussed next. Developing the package and elucidating a protocol for it required collaboration between economists, mathematicians, and computer scientists besides philosophers and ecologists—this is what it took to get our work into the field.

With Conservation International at Merauke

Margules reenters this story in 2008, by which point he had become Vice-President of CI for the Asia-Pacific region. CI had become one the biggest, richest, and most powerful non-governmental conservation organizations since its founding in 1987. But we also knew that CI was perceived very negatively by a wide array of conservation groups in the South. So, while my laboratory was excited by the prospect of applying our methodologies in the field, we approached the potential collaboration with trepidation. As it turned out we were justified in both our excitement and our trepidation.

In 2008, CI had contracted with the Medco Foundation, established by the Medco group (an Indonesian conglomerate founded by Arifin Panigoro), to devise a land use plan for an industrial forestry plantation concession obtained by Medco in the Merauke region of Papua Province in Indonesian New Guinea. The area was tropical savanna, more like northern Australia than the more famous wet evergreen forests found elsewhere in New Guinea. We would soon be practicing formal epistemology in this tropical savanna.

Medco intended to grow trees for pulp on its concession. However, it claimed to want to do so sustainably and while conserving biodiversity. According to CI personnel, the goals were to achieve sustainability of forestry production, conservation of biodiversity, maintenance of ecosystem function, and satisfaction of the interests of the indigenous communities using the habitat. These were nine Marind communities: Baad, Buepe, Kaiza, Kaliki, Kaptel, Koa, Senegi, Wapeko, and Wayau, all of which had traditional lands that intersected with the concession area. Medco made an initial commitment to exempt 40 percent of the concession area from plantation farming; however, this 40 percent included land used by the nine communities. Margules wanted to use our new multi-criteria analysis techniques to develop a portfolio of spatial plans that incorporated all the goals. This portfolio was then going to be presented to Medco for a final choice.[1]

The planning process began in Jakarta in December 2008 with a meeting that included Medco, CI representatives, other stakeholders, and members of my laboratory as decision analysts. At the Jakarta meeting, all stakeholders

identified by CI were present except, critically, representatives of the nine communities affected by Medco's proposed development who (in CI's judgment) could not be included at this early stage for logistical reasons. However, there were supposed to be further iterations of the Jakarta meeting with their participation—meetings that never happened. CI personnel took it upon themselves to represent the communities' views.[2]

The absence of systematic and routine engagement with local stakeholders led me to worry whether Medco, aided and abetted by CI, was engaged in greenwashing. Although I never had meaningful contact with Arifin Panigoro, long conversations with several members of his family and other associates led me to give Medco the benefit of the doubt. Two reasons were most important. First, in the Indonesian context, Medco seems to have no motivation for greenwashing. There were strict environmental regulations (for instance, the protection of all wetlands, which constrained our plans severely, as will be seen below). But, beyond that, there was no public environmentalist constituency that needed appeasement through greenwashing. Second—and this reason was particularly compelling for me with my Indian cultural background—upper echelon Medco personnel seemed genuinely concerned about doing something beneficial for the *Indonesian* environment. For them it was a matter of national pride.

Returning to our task of decision support, the first task as decision analysts was to understand the context and to chart the goals and values of the stakeholders. For formal multi-criteria analysis, this involved the construction of an objectives hierarchy (OH) that established the fundamental objectives of the analysis and the subsidiary objectives under each of them. In many ways, this was the most interesting part of the process since it had to be done through group deliberation. Most of the time at the first meeting in Jakarta was spent in explaining the process and developing what we took to be a very preliminary version of the objectives hierarchy.

Given our original briefing by CI, we expected the fundamental objectives to be sustainability, biodiversity, ecosystem functioning, and community interests. To our surprise, at the instigation of Medco representatives, sustainability morphed early into production suitability of a patch of habitat for plantation farming (though, admittedly, farming strategies throughout were supposed to be sustainable in the long run). Even more surprisingly, at the insistence of a variety of local stakeholders, ecosystem functioning was subsumed under biodiversity conservation. It was clear that these stakeholders had a conception of biodiversity that was less to do with entities (as in most of the North) than with processes. Spatial configuration was added as a fundamental objective while community interests remained unaltered.

As external analysts we observed and recorded these discussions but did not participate in them except to clarify technical issues about multi-criteria analysis when asked. A point that we emphasized repeatedly was that we were not

stakeholders because we were not part of the local communities affected by the decisions (and not even directly affected in some other capacity). We did promote biodiversity conservation in general but, for me, biodiversity is a local value and not a matter of global heritage—for more on this, see Sarkar (2012b). Even though we were philosophers, because of this intentional disengagement with any attempt to influence the outcome of local discussions of values, we did not enter into normative discussions that we witnessed. Perhaps we would have done so had there been an anthropologist present in the group. One of the lessons that I learned from this work was that, in contexts where there are wide cultural differences, we must have collaborations in place with anthropologists.

As expected, the stakeholder discussions generated complex hierarchies of sub-objectives under each fundamental objective. For instance, under community interests, there were nine sub-objectives at the next lower level, one to embody the interests of each of the nine communities. Below these were the goals of each community and these diverged across the set of communities. For instance, while all the other communities valued grassland within their areas, the Buepe did not. Under biodiversity, ecosystem services were incorporated using a single lower sub-objective: maintenance of all wetlands (which was a hard constraint in the sense that it was required under Indonesian law).

The most interesting structure that emerged was the hierarchy under the spatial configuration fundamental objective. This underwent modification after communities' views had been canvassed by CI. There were two sub-objectives: the first was based on biological criteria and promoted both by CI and the communities; the second, guided by economic criteria, was promoted by Medco which wanted areas slated for production to be as close to transportation links as possible. The biological criteria included standard ecological ones such as the size of individual conserved patches and the connectivity between them. However, an unexpected preference emerged from community discussions: the communities wanted conserved areas to be as close to habitation as possible. Though we did not challenge this preference while incorporating it, I pursued it further in informal discussions: the preference reflected the practice of older inhabitants from villages walking to forests to collect non-timber products. Nearby forest persistence was an important community goal.

Shortly after the Jakarta meeting, CI began surveys of the concession area and organized regular field trips to Merauke. This work was supervised by Neville Kemp of CI who had decades of field experience in Indonesia. On the basis of the field trips, which mostly involved discussions with focal groups in each of the communities, CI decided that a reiteration of the Jakarta meeting including community representatives was unnecessary: except in the case of the spatial configuration fundamental objective, there was minimal change to the original objectives hierarchy. However, this meant that all the stakeholders were never assembled together in the same place, a decision about which I continued to remain uneasy. During 2009 I spent more than a month in Indonesia spread

over three long visits. Language barriers prevented me—or any others from the University of Texas—from meaningful contact with the communities.

An even greater challenge was to elicit weights from the communities on the elements of the objectives hierarchy in such a way that the process was transparent. After trial and error, Kemp hit upon a reliable (that is, stable) method of eliciting weights. Since the relative weights across sub-objectives at any single level of the hierarchy added up to one, 100 pebbles were given to each focus group which then deliberated upon how these would be distributed across the objectives. The weight was simply the number of pebbles (divided by 100). Back in Texas, Dyer observed that this method of eliciting weights appears to be novel in the literature of decision analysis (and also that it assumes that preferences must be compounded additively, a point to which I return below).

By the middle of 2009 data collection and treatment were complete. What remained to be performed was the computational multi-criteria analysis. From my perspective, the project was progressing smoothly at Merauke. In particular, local communities appeared to be supportive of Medco's efforts, especially because they had been promised schools, roads, and other facilities to which they had not previously had access.

Producing a Portfolio

To complete our part of the project, Ciarleglio used ConsNet to produce a portfolio of plans for the Merauke concession. The computational work was done at the University of Texas. Plans differed from each other in the weights assigned to the fundamental objectives (with weights for all sub-objectives determined by the field work and preference elicitation of stakeholders). We realized that exempting 40 percent of the concession would not suffice for the goals. Kemp and I met with Medco representatives in Jakarta to ask for leeway. Ultimately Medco agreed to set aside around 55 percent, a very high proportion of the land to be dedicated for conservation, though this included a two-kilometer buffer around each village targeted for development. Nevertheless, biodiversity conservation goals were met in each of the solutions presented in our portfolio.[3]

At the end of 2009 we submitted our report to CI (Ciarleglio et al. 2009b) and it was included in their final report to Medco in 2010. Kemp and I met with Medco officials to discuss the report and I traveled to Jakarta to iron out details of the plan. Medco seemed fully satisfied. We were optimistic that the plan would be implemented, and would not only be one of very few systematic conservation plans to be implemented in practice but would also serve as a model of successful collaboration between conservation NGOs, academics, industry, and local communities. Unfortunately, it did not work out that way.

Denouement

Shortly after the final plan was presented to Medco, CI withdrew from all further involvement with the Merauke project. There was no formal announcement to that effect. Margules and Kemp had left CI, and their replacements, to the best of my knowledge, never contacted Medco about the fate of the plan. I visited the Medco office in Jakarta several times (for the last time in 2011) and was assured that the plan remained on the agenda for Medco in Papua. However, there were rumors that Medco Papua was facing financial problems that had slowed all its operations in that region.

There the matter lay until July 2017 when I was contacted by email by Jeremy Hance, a freelance journalist who wrote for the *Guardian* blog. Hance had been trying to investigate claims of malfeasance by Medco in the region. According to him, CI personnel in Washington had brushed off his questions about our project by noting that the Merauke project was in the distant past and that they had no further comment. (CI probably had good reason to avoid questions. Their regional operations had been subjected to scathing criticism by Mark Dowie [2009] whose book *Conservation Refugees* drew attention to the role of big non-governmental conservation organizations in trampling the rights and destroying livelihoods of local peoples worldwide.)

Hance drew my attention to online information provided by awasMIFEE! which described itself as being "created by independent activists in the UK as an act of solidarity with the social and ecological struggles of the people of Merauke and elsewhere in West Papua."[4] While I have no means of independently assessing the accuracy of this information, two parts of their online document are worth quoting. The first is about Senegi:

> **Kampung Zenegi, Medco Operational Area**.... Medco's approach to the village was deceitful: the company mounted a ceremony on 12th December 2009 in which it presented the village with what it termed a Certificate of Appreciation (*Piagam Penghargaan*). They also asked for the signatures of the village chief and leader of the village *adat* [governing] body on this document, and handed over 300 million Rupiah [US$33,400].
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> Several months later, in June 2010, conflict erupted when Medco attempted to remove wood that they had felled from the forests around this village. Local people were aggrieved because they felt there had been no discussion about how they were to be compensated for wood. Nor had the company fulfilled its promises to build a place of worship, a school, hire teachers or repair the road.
>
> The people had regarded the money associated with the Certificate of Appreciation as a token of goodwill, and not as the compensation a company must pay for the wood they extract. But the company had a

different point of view. According to them, the Certificate of Appreciation also had an appendix which they claimed had been discussed at the time. This appendix apparently includes an agreement that wood is to be compensated at a rate of 2000 Rupiah per cubic metre.

In the past, when the villagers have sold wood directly to wood traders, they are normally paid between 180,000 and 200,000 Rupiah per cubic metre. Aside from the deception, this agreement reveals that Medco believes its duty to compensate the community is only for the wood that grows on it. However Medco's operation is more than just a logging concession. They intend to plant fast-growing trees which they can use in their chip mill, which means that local people will not be able to use the land for any other purpose. They are being dispossessed of their ancestral lands.

There are six clans in Zenegi village, and according to the Malind people's customary beliefs, each clan is responsible for different pieces of land. Everybody knows which clan controls which area, and for a company to negotiate the surrender of *ulayat* [communal] rights, they must speak to the chief of each clan, not only the village chief.[5]

Indonesian non-governmental organizations support this story.[6]

The second concerns Buepe:

Kampung Boepe, Medco Operational Area.... The company agreed with the villagers to relocate them so they could build their factory on the site of their existing village, and plant seedlings on the surrounding land. The area now is restricted and local people cannot even enter. Meanwhile, the company has failed to provide new houses. The people have been forced to stay in other villages, and no longer have gardens. The compensation money they received was only enough to build new houses and eat during that time. The inhabitants of kampung Boepe were also deceived out of their land. A certificate to release the rights to customary land was signed, where the money was also referred to as "appreciation money" (*uang penghargaan*). The sum paid was 100 million Rupiah for an area of 1,000 hectares, which works out at 10 Rupiah per square metre [0.1 US cent]....

Kampung Sanggase, Medco Operational Area. During 2011 a prolonged conflict has developed between the people of Kampung Sanggase, and their neighbours in Kampung Boepe and Medco....

The conflict arose over which village had the *ulayat* [communal] rights over the 2,800 hectare site that Medco was using for its wood-chip factory in kampung Boepe. The survey originally carried out by CI for Medco claimed that the people of Boepe had *ulayat* rights over the land, and so the limited compensation that Medco paid was given to

> them. However four clans in Sanggase disputed that claim, saying that they owned the land, and the people of Boepe only had rights to use the land.
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> The first protest action, known as "*tanam sasi*", involved planting coconut, banana and sugar-cane in a ritual which normally takes place 40 days after someone's death. After not getting a satisfactory response, on the 17th January Sanggase villagers used a pole to close off the entrance to Medco's factory. This form of action, known as *pemalangan*, is quite common in Papua. Medco closed the factory until the dispute was resolved, and it appears from reports that it did not reopen for many months. The people were demanding compensation of 65 million Rupiah [US$7,200] for the land.
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> By April, tensions were running high. On 20th April, about 20 people from Sanggase, in traditional dress, came to … Medco Papua's offices to demand compensation. When there was no response, some of them invaded the offices, kicking and hitting the tables and doors and shouting curses at the company. At one point a leader of Medco was surrounded by angry villagers who refused to let him move, until he was rescued by police.… [E]ventually the company offered to pay a sum of three billion Rupiah, which was accepted by the people in a ceremony on 24th October 2011.[7]

If these reports are accurate, and I know of no reason to question them, the location of the factories follows the recommendations of our portfolio though no other aspects of those plans appear to have been implemented. This is little solace given than Medco had not kept its promises to build schools and roads, and its relations with the local communities was now increasingly exploitative even if it had once been more equitable. What was also troubling was that CI had involved itself in local resource ownership disputes.

Lessons and Final Remarks

The Merauke analysis remains one of the most complex multi-criteria analyses so far attempted in efforts to implement systematic conservation planning in the field. Reflection on this story leads to two sets of observations on what philosophy has done for the practice of conservation planning in the field and, conversely, three observations on how that practice influenced philosophy.

With respect to the role of philosophy in influencing scientific practice, first and foremost, our involvement ensured that a distinction was maintained between decision analysts and stakeholders. From the first Jakarta meeting, CI personnel presumed that they were stakeholders in the unfolding process rather than outsiders brought in for technical expertise. As many environmentalists (particularly from the South) have pointed out, this type of presumptuous

arrogance has often been characteristic of Northern individuals and institutions operating in the South, as they have the advantages of technical know-how and economic resources. We—that is, those who worked on the project at the University of Texas—prevented such an attitude from dominating the protocol at the first Jakarta meeting; in this we were aided by being in a context in which we, and not CI, were the ones with the intellectual resources and experience to undertake the final multi-criteria analysis that would provide the map to be used for implementation on the ground. However, our success was only partial: members of the local community were not present as stakeholders at the first meeting even though they were subsequently consulted.

The second set of observations consists of three related points. Even before development of ConsNet, philosophical reflection on conservation biology and systematic conservation planning, and attempts to explicate a clear framework for the latter, had come to dominate my approach to conservation practice in at least three ways. First, philosophers such as Bryan Norton and Baird Callicott had already been arguing that biodiversity is a normatively loaded concept. This had led me to propose a culturally relativized attitude to what could count as biodiversity features (or as surrogates for them) that were the goal of conservation planning. Next, as noted earlier, the attempt at explicating the framework of systematic conservation planning led us to appreciate the problem of setting targets and to emphasize the extent to which normative assumptions permeated our work. Finally, conceptual analysis also led to technical innovation in systematic conservation planning. Realizing that minimum area and maximum representation were not dual problems was important. It showed the extent to which the latter can be flexibly approached in the field. There are many other such technical examples. To the extent that Margules and I, through our textbooks, and through prominent collaborators such as Sánchez-Cordero, have had any impact on systematic conservation planning beyond our own work, these philosophical influences may have spread far and wide.

Turning to the converse process: the experience of planning for Merauke has implications for philosophy. First, we were forced to confront the question of who was a legitimate stakeholder in the relevant decisions about the habitat. I will construe this question as posing an ethical problem and call it the problem of *ethical standing*. Elsewhere, I have pointed out that although stakeholder consultation has become fashionable in environmental decisions, very little attention has been paid to the question of legitimacy—who has ethical standing. Moreover, the term "consultation" implies that at least some of the included stakeholders do not have decision-making authority, that the process of including them is ultimately window dressing designed to conceal asymmetries of power. The same asymmetries are typically reflected when stakeholders are selected to sit at the table. As I also argued earlier, analyzing how courts handle claims of legal standing could help answer this question, though only to a limited extent: ethical standing cannot be reduced to legal standing.

During our work we were very careful to maintain our role as decision analysts who supported the decision process but did not participate by voicing preferences because we did not view ourselves as stakeholders. (Of course, there remains a valid worry that, in spite of our best efforts, we were implicitly guiding the decisions. One telling moment, though, was when the stakeholders decided that ecosystem services were subordinate to biodiversity conservation in the objectives hierarchy. Though I found that choice idiosyncratic, I did not voice any opinion.) In contrast, CI personnel routinely injected themselves into the decision and this led me to question whether CI was even a legitimate stakeholder. Why should CI, based in Arlington, Virginia so as to be close to the corridors of power in Washington, DC, have ethical standing over the future of the homes of indigenous communities in New Guinea? Perhaps because it was contracted by Medco? But Medco only had legal standing because of concession given to them in distant Jakarta. Did Medco have ethical standing? The problems noted earlier may well have been avoidable if these issues had been addressed at the beginning of the project. Environmental philosophers, especially in the United States, have spilt much ink over abstract, practically irrelevant questions such as whether species have intrinsic value. When it comes to philosophical questions about the environment that have tangible consequence—for instance, that of establishing ethical standing—environmental philosophers, with very few exceptions, have contributed little of value. That situation needs to be changed. Paraphrasing Marx, it is not enough to interpret the world—the point is to change it.

Second, I have been arguing for several decades that conservation biology presents unique opportunities for philosophers of science insofar as they can be witness to the founding of a science (Sarkar 2005). Conservation planning in the field illustrates this point beautifully, showing how practical choices may become reified as essential components of a scientific framework. Recall how communities' weights on preferences were established by division of 100 pebbles between alternatives. We did that only because it worked in practice (and turned out to be an innovation from the perspective of decision analysis). Suppose that this strategy becomes standardized in the field. What that will mean is that the field will accept the "naturalness" of an additive model for integrating preferences. But there are alternatives, most importantly multiplicative models, and these would have been elided because of an initial practice-guided choice made for convenience. In philosophy of science, this would favor an instrumental rather than realist reading of scientific frameworks. There are other such examples. The main insight to be drawn from this discussion is the poverty of armchair philosophy compared to what the discipline can be if guided by field experience.

Because our plan is no longer likely to be implemented at Merauke, our work there, in one very tangible sense, must be regarded as a failure. However, the idea of systematic planning for habitats using multiple criteria has been

widely disseminated in the Papua region (and elsewhere in Indonesia) because of the visibility of this attempt. In that sense, the work was not a complete failure.

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Notes

1 The discussion that follows is based on Ciarleglio et al. (2009b) and Sarkar et al. (2017).
2 The discussion below will adhere to confidentiality agreements that will prevent me from discussing stakeholders other than Medco and CI in more detail and, even for Medco and CI, many individuals will not be named.
3 Some typical solutions were published as part of Ciarleglio et al. (2009b) and Sarkar et al. (2017).
4 awasMIFEE!, "About Us." https://awasmifee.potager.org/?page_id=37 (last accessed August 23, 2018).
5 awasMIFEE!, "Reports from Villages." https://awasmifee.potager.org/?page_id=60 (last accessed August 23, 2018).
6 See, for example, Franky Samperante (November 2011), "PUSAKA in the Land of Papua." www.downtoearth-indonesia.org/story/pusaka-land-papua (last accessed August 23, 2018).
7 awasMIFEE!, "Reports from Villages." https://awasmifee.potager.org/?page_id=60 (last accessed August 23, 2018).

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