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A New Technology-Based Tool for Building Profitable Biodiversity-Conserving Offerings

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ABSTRACT:
Biodiversity conservation is an essential but too-frequently overlooked dimension of environmental sustainability. Most endangered species live in developing countries. In these countries, sustainable development projects need to leverage efforts to protect biodiversity rather than being at cross-purposes with them. To these ends, this article describes a business plan that has a firm market a biodiversity offering that is profitable and supports a biodiversity project. This project, in-turn, enhances biodiversity. Customers are kept abreast of the project's biodiversity impacts by viewing an online biodiversity dashboard. This dashboard graphically portrays data on the project and the abundance of the targeted species. Remote sensing and other Internet of Things (IoT) technologies are used to pipe this data to the dashboard. For purposes of illustration, this plan is hypothetically applied to preserving the South African rhinoceros (Ceratotherium simum). A set of agent submodels dynamically portrays firms in a business network that employs would-be rhino poachers. A general purpose tool for constructing these interacting submodels is detailed.

Keywords: biodiversity, sustainable business ventures, political-ecological systems, agent models, rhinoceros poaching, dashboards

1. Introduction

Biodiversity conservation is a controversial component of environmental sustainability (Lenzi et al., 2023). A salient challenge is how to protect wildlife without limiting the opportunities of people living close to these animals. Currently, most solutions involve governmental intervention (Carlson et al., 2023; Priyadarshini et al., 2022; Pulido-Chadid et al., 2023). But business activities are mostly driving the planet's current catastrophic loss of biodiversity. To transform private enterprise into being a solution to biodiversity loss instead of being its main cause, a business plan is proposed wherein firms launch products or services (hereafter, offerings) that support projects that enhance biodiversity.

Focusing for the moment on firms who sell directly to end users (called business to customer (B2C) firms), the strategy involves a firm launching a biodiversity offering that is both associated with a biodiversity project, and marketed to biodiversity-concerned consumers (Figure 1).

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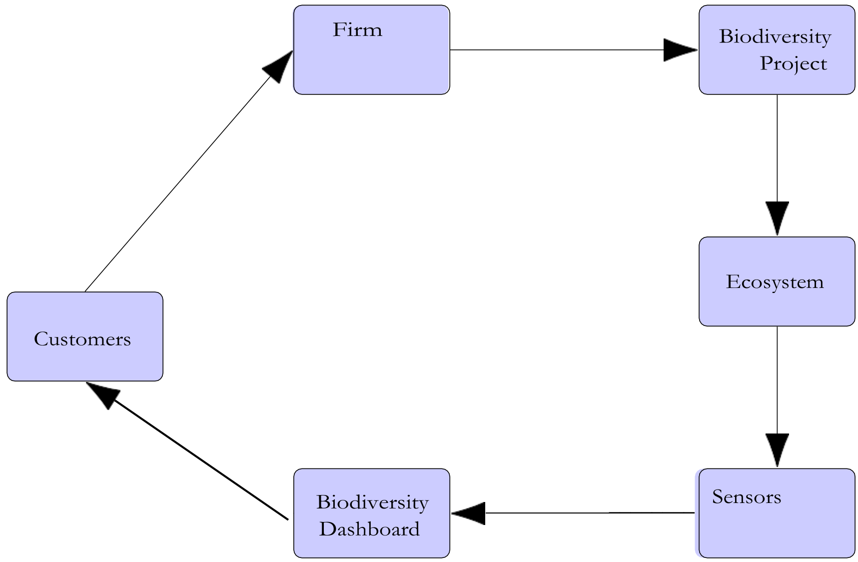


Figure 1: Biodiversity-conserving business plan schematic.

This strategy minimizes the biodiversity project's costs while ensuring its positive impact on biodiversity. To accomplish this, new tools are used to build a profitable and biodiversity-enhancing business venture via agent submodels of business networks. These submodels are optimized for profitability through the use of new optimization procedures. The political context of the biodiversity project is comprehended by first acquiring data using new algorithms that parse in real-time, online commentary on the project's political-ecological system; and then second, using thisdata to fit the parameters of a set of interacting submodels of that system. Brand loyalty to the offering is maintained through an online biodiversity dashboard. This dashboard graphs real-time data that details the project's impact on the targeted species.

This dashboard keeps biodiversity-concerned customers abreast of the project's impact on the managed species. This feedback helps to ameliorate the sense of powerlessness that these customers often experience when deciding whether to purchase a sustainable offering or not (Seyfang, 2005). This feedback would also contribute to brand loyalty as customers would be able to verify whether the firm was having an ongoing and positive impact on biodiversity.

Attracting customers to biodiversity offerings and having these customers repeatedly purchase them may be the only way biodiversity can be conserved in the long term. In other words, unless humans find ways to profit from biodiversity conservation and further enact these operations, biodiversity will eventually disappear. For illustration, this business strategy is hypothetically used to conserve the South African rhinoceros. A set of agent-based submodels represents the dynamics of several firms interacting with each other in a business network that employs would-be rhino poachers to manufacture furniture in Johannesburg, South Africa. Output from these interacting submodels is shown and the tool used to build them is detailed. This tool, called the Ecosystem Management Tool (EMT) is freely available from the author.

1.1 Business plan

Depending on the firm, planners may customize their business plan for firms that sell only to other firms. Such firms are referred to as business-to-business (B2B or B-to-B) or supplier firms (see Wengler & Kolk (2023)). Examples of such firms include Alcoa, Boeing, Boise Cascade, and Maersk. From the perspective of a B2B firm, A B2C firm is sometimes referred to as an original equipment manufacturer (OEM) and its customers as end users or indirect customers.

The four main steps a firm executes to build and bring to market a profitable biodiversity offering are as follows.

Step 1: A firm selects a species they want to conserve. One way of determining the status of a species is its rank on the Red List Index (RLI). This list is managed by the International Union for the Conservation of Nature (IUCN) (Young et al., 2014). The firm could select one or more endangered or criticallyendangered species from this list.

Step 2: The firm develops a biodiversity project. This project is associated with the biodiversity offering by (a) directing the marketing department to market the offering and project as a pair; and (b) directing the accounting department to assign the offering and project to the same budget line. If the project involves operations in other countries, the firm enters into a partnership with each involved country and secures all needed permits.

Step 3: The parameters of this project are tuned so that it has the highest chanceof being politically feasible while maximally conserving biodiversity. This is accomplished by using the EMT to build a political-ecological system simulator (hereafter, simulator) of the species-hosting political-ecological system. This simulator is an agent-based model of the interactions through time of all groupsthat impact the ecosystem. Using the EMT, the simulator's parameters are fitted to a political-ecological data set (Haas & Ferreira, 2018).

Next, firm planners add the biodiversity project to the simulator and use the EMT to solve for the most practical ecosystem management plan (MPEMP) (Haas & Ferreira, 2018). This plan is a set of project parameter values that makes the project politically feasible to implement; (b) minimizes its cost; and (c) makes it maximally effective at conserving the species identified inStep 1.

The firm markets the biodiversity offering by advertising that part of the offering's purchase price is a biodiversity premium. This premium will support the offering's associated biodiversity project. This marketing campaign involves using data analytics to shape demand (Chase, 2013: ch.9), i.e., by executinga combined strategy of a pricing schedule, and an advertising campaign that focuses on the biodiversity-enhancing benefits from purchasing the offering. Then, under this demand shaping strategy, demand is forecast. Using this forecast, the firm finds a price for the offering that is both profitable and, through its biodiversity premium, is sufficient to maintain the biodiversityproject.

Step 4: After launching the biodiversity offering, the firm maintains a public-facing biodiversity dashboard that contains real-time information on the project and the species being conserved. The dashboard's credibility is maintained by having an auditing firm conduct audits of the accuracy of the dashboard'sdata. These audit reports are accessible from the dashboard.

1.2 Lean startup business plan structure

This business plan can be integrated into a standard business plan structure fora startup firm. One such structure is the Lean Startup Business Plan developed by the United States Small Business Administration (SBA, 2023). The following sequence of steps is this plan wherein each italicized step indicates the associated step in the above plan for launching a biodiversity offering.

Partners: Identify other firms that will interact with the startup.
Step 2
Activities: Identify actions to take to reach potential customers.
Steps 3 and 4
Resources: Identify available resources such as people, lines ofcredit, or patents. Step 2
Value declaration: Prepare a declaration of why the offering wouldbe valuable to a customer. Step 3
Customer interactions: Explain how the firm will talk to potentialand existing customers. How will the firm listen to customers? Step 4
Market niches: Describe niches that the offering's advertisementswill be directed towards. Step 3
Outlets: Identify what outlets or channels that the firm will use tocommunicate with customers. Step 4

Balance sheet: Prepare a managerial accounting budget for the delivery of the offering. Explain ways that production/delivery costs will be minimized. Step 3
Income sources: List all sources of cash from placing the offering on the market. Will cash only come from sales? Will cash accrue from leases and/or rentals? Step 3

2. Potential Biodiversity Offerings

The two lists, below are suggestive of the range of offerings that firms may attach biodiversity projects to.

2.1 Offerings made by B2C firms

Types of offerings for sale to biodiversity-concerned customers:
Consumer goods: food, healthcare products, household goods, vehicles, and electronics.
Consumer services: communication providers, energy, insurance, entertainment

(sporting events, movies, concerts), travel, tours, cruises, education, and restaurants.

2.2 Offerings made by B2B firms

A B2B firm runs a biodiversity project and charges a premium for its offering when selling it to a B2C firm who in-turn, passes this premium to customers who purchase their associated biodiversity offering. To take a hypothetical example, say that Alcoa charges a premium to Ford Motor Co. for their biodiversity aluminum ingots that are associated with a biodiversity project focused on mine-tailings restoration. Ford Motor Co. in-turn, charges a premium to customers for the biodiversity version of their Edge(TM) model automobile because it contains parts made from these Alcoa ingots. Both the B2B firm and the B2C firm advertise the biodiversity project but only the B2B firm maintains the biodiversity project and attached biodiversity dash-board. How a B2B firm can drive a successful advertising campaign is detailed in Wengler & Kolk (2023).

3. Agent-Based Models of Political-Ecological Systems

Agent-based submodels make decisions about actions that affect the targeted species. Agents include poachers, kingpins, consumers, farmers, wildlife protection agencies,governments, and other firms who are part of the business network that operates the firm's biodiversity project. An individual-based submodel is also constructed of how the species' abundance affects and is affected by agent actions.

All business agents have customers and a workforce. Buyer-facing agents set prices that were determined during the marketing campaign and have inventories that they replenish from suppliers. At each time point, all agents update in a randomorder. An order placed at one time step is filled within the next step.
To achieve credibility, this political-ecological model is fitted to parsed streamsof news articles, and streams of ecological metric observations such as species abundance (Haas & Ferreira, 2018). Parsing is performed with new algorithms runningon cluster computers.

4. Biodiversity-Concerned Customer Feedback LoopTechnologies

Depending on the offering's particular industry and targeted ecosystem, different technologies are needed to forge feedback loops from the ecosystem back to biodiversity-concerned customers.

4.1 Political

1. Real-time parsing and display on the biodiversity dashboard of actions affecting the project's ecosystem as reported in online news stories.
2. Real-time mining of social media sites for references to actions affecting the project's ecosystem.

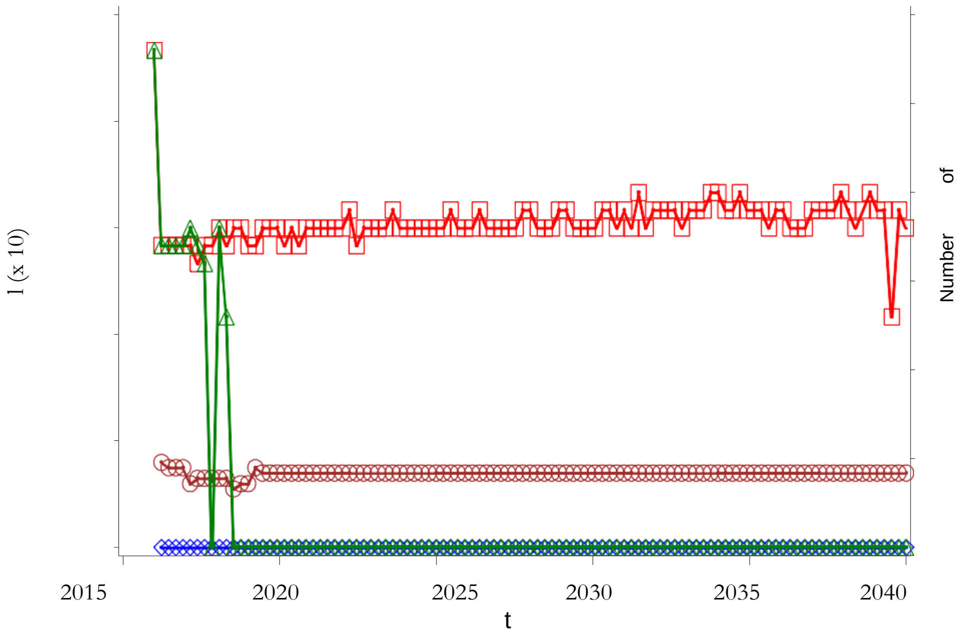
4.2 Ecological

1. Automatic acquisition and summarization of remotely-sensed data on the project's ecosystem. An example is the use of satellite images to estimate below-ground biomass of a carbon sequestration plantation (Chapungu et al.,2020). Such images can also be used to detect large animals (Haas, 2018).
2. Per-month average value of a water quality index observed across all water sources. For example, Kaur et al. (2023) develops an index that is optimized for measuring the quality of drinking water for wildlife living on a grassland or lowveld.
3. Real-time parsing of scientific reports on the project's ecosystem.
4. Smart-device uploads by project personnel of observations read from monitoring equipment installed to monitor the project's ecosystem.

Technologies exist for linking ecological data streams to persistent dashboards that in-turn, graphically display them in real-time (AIAI, 2023; Paz et al., 2022; Riffat et al., 2023).

5. Example

Haas (2022) studies a proposed biodiversity offering whose goal is the conservation of the South African rhino. A hypothetical furniture manufacturer named "Elegant Furniture" launches a line of eco-furniture as their biodiversity offering. The associated biodiversity project is the operation of a furniture factory in Johannesburg that exclusively employs would-be poachers who formerly lived in the townships that surround Kruger National Park (KNP), South Africa. This furniture factory is an exemplar of an in-country operation (ICO). Figure 2 shows the effect of the proposed biodiversity project on the rate of rhino poaching in and around KNP.The Figure indicates that poaching goes down when poachers learn that a legal jobis preferable to poaching.
All computations in this example were performed in the author's JAVA(TM)- based EMT. These computations include the construction and running of all agent-based submodels of the simulator, the simulator's individual-based submodel of the rhino population, computation of the solution to the optimization problem of finding the simulator's statistical estimates of its parameters, and computation of the optimization problem of finding the MPEMP. This tool can be freely downloaded from www.profitablebiodiversity.com.



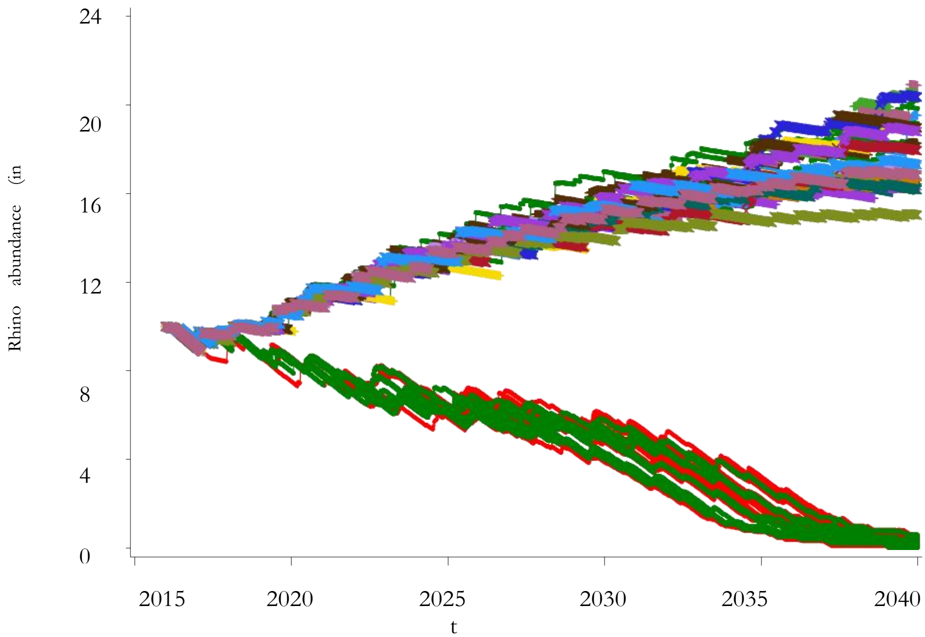


Figure 2: Top: poachers learning parameter, l (diamonds= pure profit strategy, circles= MPEMP), and number of poached rhinos (squares, triangles) over the interval 2015 to 2040. Bottom: rhino abundance (diamonds, circles). Each curve isa time series of the KNP rhino abundance submodel's output. The cluster of nine curves that is decreasing over time is computed under the plan that maximizes profitalone. The cluster of curves that is increasing on the other hand, is computed under the MPEMP (from Haas (2022)).

6. Discussion

6.1 Making biodiversity offerings profitable

A firm will continue to market a biodiversity offering only as long as it is profitable tothem. There are four ways to increase an offering's profit. Consider some accountingperiod, e.g. one year. Let CO be the offering's annual cost, CP, the project's annualcost, RO, the offering's annual revenue, and RP, the project's annual revenue,if any. For instance, in the above example, RP would be the total annual salesof furniture produced at Elegant Furniture's ICO. The offering's profit then, is$RO + RP - CO - CP$. Reducing CO and/or CP – or increasing RO and/or RPwill increase the offering's profit. And the offering will appeal and be affordable toa wider niche of biodiversity-concerned customers as the offering's price decreases.

The sustainability of a firm's biodiversity project then, will depend on achievinga price for the offering that attracts biodiversity-concerned customers in sufficient numbers so that when the above profit computation is made each year, it is always positive. But the offering's price is in-part, determined by the size of its biodiversity premium. Hence, minimizing this premium is crucial to making the associated bio-diversity project and consequently, the targeted species, sustainable. The MPEMP computation available in the EMT, provides one way to minimize this premium.

As shown mathematically in Haas (2022: Supplement), the objective function used in the constrained optimization problem that is solved to produce the MPEMP,includes the premium function. This function is dependent on the size of thebiodiversity-concerned customer niche and on the operating costs of the biodiversity project. The MPEMP is the solution to this optimization problem wherein the premium function is minimized under the two constraints that (1) the offeringis profitable; and (2) abundance of the targeted species is nondecreasing over the accounting period. In other words, by computing the MPEMP, a firm can learn what size premium will be needed in order to balance revenues with costs so that the offering is both profitable and effective at conserving the targeted species. The offering's profitability is a necessary condition for the sustainability of itself, the project, and the targeted species.

Of course, in the real world, there may not be enough biodiversity-concerned customers willing and able to purchase a biodiversity offering for it to be sustainable. Recent research, however, suggests that the potential size of this niche may be large (Petro, 2022; Tully & Winer, 2013; Wheland and Kronthal-Sacco, 2019). Further, Kotchen (2006) and Elfenbein & McManus (2010) show that consumers prefer to purchase a product that is linked to a charity rather than directly donating to that charity. Currently, the moniker: cause-related marketing denotes a marketing strategy that advertises that purchase of the campaign's offering will benefit a particular charitable cause. See Bhatti et al., (2023).

A biodiversity offering has a built-in competitive advantage. Such an offering would have no direct competitors unless other firms offer the same product or service with their own attached biodiversity project. The burden of this advantage, however, is that it will be crucial for an offering's sustainability to market it to as many biodiversity-concerned consumers as possible.

6.2 Sustainable development can deter poaching

Unemployment is often high in developing countries where many endangered species live. It is possible that any development project such as a furniture manufacturing network ICO as described in this article's example would not provide enough eco- nomically attractive jobs to deter poaching by poor and unemployed local residents.There are, however, examples of when such a strategy does indeed reduce poaching. For instance, the Pole Pole Foundation in the Democratic Republic of Congo has slowed the poaching of gorillas by developing sustainable employment alternatives for would-be gorilla poachers (Kahekwa, 2024). And Downey (2020) reviews alternate-employment projects that reduced the poaching of tigers in India; elephants, lions, and sable antelopes in Mozambique; and sea turtles along Nicaragua's coasts.

There is, however, the issue of scale. For instance, providing 10 jobs in a region of1000 would-be poachers will not significantly impact the poaching rate in that region.Job creation by private firms would have to be at a scale commensurate with the number of unemployed individuals in a region. By recognizing that unemployment among Africa's youth is forecast to reach 50% within a few decades (Haas, 2022), theimmense scale of solutions both in number and size that are needed to significantly curb world-wide biodiversity loss can be expressed in human terms.

6.3 The need for continuous and verified monitoring

Step 4 of the above Business Plan is crucial to the success of a biodiversity offering. Unless biodiversity-concerned customers can access the biodiversity dashboard at their convenience and believe that the data there has not been manipulated, these customers will eventually stop purchasing the offering. Therefore, monitoring of species abundance and the project's impact variables such as the region's poaching rate, need to be continuous. Maintaining the technology to keep the dashboard on- line and fed political-ecological data needs to be the first priority of the biodiversity project's managers.

A reputable auditing firm needs to be paid to conduct regular audits of the veracity of all data displayed on the dashboard. Haas (2022) gives a hypothetical biodiversity dashboard with associated data veracity measures that have been as- signed by an outside auditing firm. The auditing firm would stand behind these veracity measures by publishing their contact information and a link to their audit report on the dashboard.

7. Conclusions

By using the technology tools described in this article, for-profit firms can significantly help conserve biodiversity while making money at the same time. In particular, the technologies described herein enable firms to win customer loyalty that translates into the funding of biodiversity projects that may be located thousands of miles away from where these customers live. Several challenges, however, remain. These are outlined below.

7.1 The need for a faithful model of the political-ecological system

For the simulator of the political-ecological system to be useful for purposes of predicting a biodiversity project's impacts on a species' sustainability, it needs to be a faithful model of the dynamics between political forces and the modeled ecosystem. It also needs to accurately model the decision making of various groups involved in the implicit and explicit management of that ecosystem. Finally, the species abundance model needs to contain enough detail to track how species abundance responds to ecosystem management actions. This collection of interacting political and eco- logical processes can be complex and will require substantial political-ecological datain order to fit all of its parameters with enough certainty for the resulting simulator to accurately predict the political-ecological system's dynamics under different, proposed biodiversity project operations. Haas & Ferreira (2018) demonstrate that such simulator can be constructed and fitted to a large set of political-ecological observations.

Haas (2024) gives a reproducible protocol along with all needed software forthe automatic acquisition of political-ecological data. This protocol adheres to the rigorous requirements of the STAR (Structured Transparent Accessible Reproducible) Protocol standard set by Cell Press, see www.cell.com/star-protocols/aims. CellPress publishes the definitive journal on the biology of the human cell: Cell. A firm employing this protocol will speed their acquisition of political-ecological data and hence, it will be easier for them to statistically update the parameters of their simulator for purposes of evaluating the effectiveness of a proposed change in the operation of a biodiversity project.

7.2 Local community responses to biodiversity projects

Skidmore (2023) in the context of tiger poaching in the Russian Far East, finds that poachers are motivated by poverty, anger and frustration stemming from structural inequalities between social classes, and human-tiger conflict. The author discoveredthrough interviews with poachers that by far the most important of these drivers was poverty. Duffy et al., (2016) also find reasons other than economic hardship thatdrive local residents to poach wildlife. Indeed, the United Nations Office on Drugs and Crime maintains a Learning Module on sustainable livelihoods and community engagement that unpacks the many motivations for poaching wildlife by Indigenous Peoples and Local Communities (IPLCs) (UNODC, 2024).

Although economic necessity is a often a major driver of poaching pressure ona species, if the local population is usually poaching out of protest of perceived in- equalities and/or feelings of having their needs abrogated by their government and replaced by a mandate to protect wild animals, then a biodiversity project thatis intended to provide jobs to would-be poachers would be ineffective at stemminga poaching threat to the firm's targeted species. Hence, when social injustice isat the heart of a region's poaching activity, a project is needed that will convincethe region's residents that their concerns are being heard and addressed. In these situations, there has been some success with employing would-be poachers as antipoaching rangers as is done for example, by the Pole Pole Foundation (Kahekwe, 2024). But unless the relevant government passes legislation that rights past wrongs against these IPLCs, there is little that private enterprise can do to stem such poaching. In these cases, a firm might have more success by running a wildlife reserve or captive breeding facility that is outside of the region suffering from social injustice.

7.3 The need to customize a biodiversity project

Once a species and region are identified for conservation, a biodiversity project needs to be envisioned that will be politically feasible for that region and ecologicallyeffective at conserving the targeted species. Depending on the political situation andnature of the threats to the species, the most effective project may take many formssuch as a source of alternate employment for would-be poachers as in this article's example; a habitat restoration project; a focused criminal investigation into the wildlife trafficking of a particular species; the creation of a wildlife reserve; or the operation of a captive breeding facility for a severely endangered species. Whatever form the project takes, its scale needs to eventually be commensurate with the scaleof the species' threat vector. For example, if a certain bird is threatened due to loss of its nesting grounds in a marshland, a project might start with only a few hectares of wildlife reserve in the marshland, and then increase its holdings over time.
Each species and region will have its own best-project. Project scale can grow over time but there is no project type that will be best for all species-region combinations, i.e., a project that works in one situation would most likely not be replicated into another species-region combination.

7.4 Other roadblocks to implementing a biodiversity project

As discussed in Haas (2022), beginning a project in a developing country can bring with it additional challenges that include a lack of infrastructure, political instability, and regulatory hurdles. Haas (2022) recommends that a firm wanting to begin such a project in any foreign country, hire a liaison consultant who is a local resident of that country and is versed in the political situation there; knows who needs to be contacted; and knows what donations need to be paid to who in order to receive the necessary permits to begin the project. In addition, this local consultant would mitigate the reluctance that people living in a developing country often have towards any firm from a developed country that wants to start an operation in their country.

Lack of infrastructure would present both an opportunity and a difficulty. There would be an opportunity to employ local residents to build the needed infrastructure but doing so would increase the biodiversity offering's biodiversity premium.

7.5 Future research

Areas that need further work include the following.
The launch of an actual, experimental biodiversity offering and associated biodiversity project. Even if this offering failed, the experience gained would be invaluable for designing future biodiversity offering-biodiversity project pairs. Such an

experimental pair could be underwritten by a grant to an interested firm from, say, the United States Small Business Administration or the Euro- pean Union.
Building a hardware/software package that monitors political-ecological metrics and streams the gathered data to a biodiversity dashboard. As mentioned above, such end-to-end packages are already available (AIAI, 2023; Paz et al., 2022; Riffat et al., 2023). Ideally, this package would use off-the-shelf IoT hardware and software components. And it would be easy to set up by non- specialists. Further, the installed package would be persistent, self-healing, and self-restarting. The technology for building such a self-repairing system exists today, see Johnphill et al. (2023).

References

AIAI (2023). EARTHRANGER, The Allen Institute for Artificial Intelligence. Re- trieved May 2, 2024 from www.earthranger.com/technology

Bhatti, H. Y., Galan-Ladero, M. M., & Galera-Casquet, C. (2023). Cause-related marketing: A systematic review of the literature. Interna- tional Review on Public and Nonproft Marketing, 20: 25-64. 10.1007/s12208-021-00326-y

Carlson, S. C., Vucetich, J. A., Elbroch, L. M., Perry, S., Roe, L. A., Butler, T., & Bruskotter, J. T. (2023). The role of governance in rewilding the United States to stem the biodiversity crisis. BioScience, 73(12), December: 879-884. 10.1093/biosci/biad099

Chapungu, L., Nhamo, L., & Gatti, R. C. (2020). Estimating biomass of savanna grasslands as a proxy of carbon stock using multispectral re- mote sensing. Remote Sensing Applications: Society and Environment, 17, January, 100275. 10.1016/j.rsase.2019.100275

Chase, Jr., C. W. (2013). Demand-Driven Forecasting, Second Edition, Wiley, Hoboken, NJ.

Downey, H. (2020). Turning the Problem into the Solution, Property and Environ- ment Research Center (PERC). Retrieved July 28, 2024 from
www.perc.org/2020/04/08/turning-the-problem-into-the-solution/

Duffy, R., St John, F. A. V., Bu¨scher, B., & Brockington, D. (2016). Toward a new understanding of the links between poverty and il- legal wildlife hunting. Conservation Biology, 30(1): 14-22. 10.1111/cobi.12622

Elfenbein, D. W. & McManus, B. (2010). A greater price for a greater good? Ev- idence that consumers pay more for charity-linked products. American Economic Journal: Economic Policy, 2(2), May: 28-60.

Haas, T. C. (2024). Protocol to discover machine-readable entities of the Ecosys- tem Management Actions Taxonomy. STAR Protocols, Cell Press, Elsevier, 5(2), 103125: 1-12. 10.1016/j.xpro.2024.103125

Haas, T. C. (2022). Profitable biodiversity. Cogent Social Sciences, 8(1): 1-24.
10.1080/23311886.2022.2116814

Haas, T. C. (2018). Automatic acquisition and sustainable use of political-ecological data. Data Science Journal, 17, p.17. 10.5334/dsj-2018-017

Haas, T. C. & Ferreira, S. M. (2018). Finding politically feasible conservation strate- gies: The case of wildlife trafficking. Ecological Applications, 28(2), 473-494. 10.1002/eap.1662

Johnphill, O., Sadiq, A. S., Al-Obeidat, F., Al-Khateeb, H., Taheir, M. A., Kai- wartya, O., & Ali, M. (2023). Self-healing in cyber-physical systems using machine learning: A critical analysis of theories and tools. Future Internet, 15, 244. 10.3390/fi15070244

Kahekwa, J. (2024). The Pole Pole Foundation. Retrieved July 28, 2024 from
www.polepolefoundation.org/ as discussed in
www.tunzagames.com/post/how-does-giving-someone-a-job-save-wildlife

Kaur, M., Das, S. K., & Sarma, K. (2023). Water quality assessment of Tal Chhapar Wildlife Sanctuary using water quality index (CCME WQI). Acta Ecologica Sinica, 43: 82-88. 10.1016/j.chnaes.2021.09.017

Kotchen, M. J. (2006). Green markets and private provision of public goods. Journal of Political Economy, 114(4): 816-834.

Lenzi, D., Balvanera, P., Arias-Ar´evalo, P., Eser, U., Guibrunet, L., Martin, A., Muraca, B., & Pascual, U. (2023). Justice, sustainability, and the diverse values of nature: Why they matter for bio- diversity conservation. Current Opinion in Environmental Sustainability, 64: 101353. 10.1016/j.cosust.2023.101353

Paz, A., Silva, T., & Carnaval, A. C. (2023). A framework for near-real time monitoring of diversity patterns based on indirect remote sensing, with an applications to the Brazilian Atlantic rainforest. Peer J, 10: e13534. 10.7717/peerj.13534

Petro, G. (2022). Consumers demand sustainable products and shopping formats.

Forbes, March 11. Retrieved August 2, 2022 from

https://www.forbes.com/sites/gregpetro/2022/03/11/consumers-demand-sus

?sh=68ad9b456a06

Priyadarshini, P., Bundela, A. K., Gasparatos, A., Stringer, L. C., Dhyani, S., Dasgupta, R. Reddy, C. S., Baral, H., Muradian, R., Karki, M., Abhilash, P. C., & Pen˜uelas, J. (2022). Advancing global biodiversity governance: Recommendations for strengthening the post-2020 global biodiversity framework. Anthropocene Science, 1(1): 195-203. 10.1007/s44177-022-00013-5

Pulido-Chadid, K., Virtanen, E., & Geldmann, J. (2023). How effective are pro- tected areas for reducing threats to biodiversity? A sys- tematic review protocol. Environmental Evidence, 12: 18. 10.1186/s13750-023-00311-4

Riffat, M., Esmail, B. A., Wang, J., & Albert, C. (2023). Biodiversity and ecosystem services dashboards to inform landscape and urban planning: A systematic analysis of current practices. Ecosystems and People, 19(1): 2263105. 10.1080/26395916.2023.2263105

SBA (2023). Write your business plan, United States Small Business Administra- tion. Retrieved May 2, 2024 from

www.sba.gov/business-guide/plan-your-business/write-your-business-pla

Seyfang, G. (2005). Shopping for sustainability: Can sustainable consumption pro- mote ecological citizenship? Environmental Politics, 14: 290- 306.

Skidmore, A. (2023). Exploring the motivations associated with the poaching and trafficking of Amur Tigers in the Russian Far East. Deviant Behavior, 44(3): 331-358. 10.1080/01639625.2022.2045177

Tully, S. M. & Winer, R. S. (2013). Are people willing to pay more for socially re- sponsible products: A meta-analysis. Working Paper, March. 10.2139/ssrn.2240535

Wengler, S. & Kolk, M. (2023). Applying multi-stage marketing in industrial markets: Exploratory insights on its successful implementation, management and adaptation in dynamic markets. Industrial Marketing Management, 108: 205-222.

10.1016/j.indmarman.2022.11.012

Whelan, T. & Kronthal-Sacco, R. (2019). Research: Actually, consumers do buy sustainable products. Harvard Business Review, June 19. Retrieved August 2, 2022 from https://hbr.org/2019/06/ research-actually-consumers-do-buy-sustainable-products

UNODC (2024). E4J University Module Series: Wildlife Crime Module 5: Sustain- able livelihoods and community engagement. Retrieved July 28, 2024 from

www.unodc.org/e4j/en/wildlife-crime/module-5/key-issues/ terminology.html

Young, R. P., Hudson, M. A., Terry, A. M. R., Jones, C. G., Lewis, R. E., Tatayah, V., Zu¨el, N. & Butchart, S. H. M. (2014). Accounting for conservation: Using the IUCN Red List Index to evaluate the impact of a conservation organization. Biological Con- servation, 180: 84-96.