Biodiversity Case Study: Conservation in the Amazon[1]

Armando Santos grew up the son of rubber tappers in the city of Tailândia, Brazil, in the northern state of Pará. Throughout his childhood, Armando would often accompany his parents on their trips into the Amazon forest to harvest latex from the trees (a sustainable, legal process). His rubber tapper parents often directly competed with illegal loggers, slash-and-burn farmers, and cattle ranchers. Logging, farming and ranching typically destroy mature, "mother-trees" that rubber tappers harvest from. Entrenched in the Tailândia community, however, Armando did not blame his fellow citizens for the Amazon's destruction; he knew that many people log the forest out of financial or personal desperation. Most citizens of Tailândia rely on soybean agriculture, cattle ranching, and logging for their income.

Armando became interested in how people and the forest could co-exist, and he went on to complete undergraduate and masters degrees in biology at the local university, with a special focus on coupled social and ecological systems. Throughout his education, he became more aware of the political and economic implications of forest management and realized that as a biologist he wouldn't have the type of political power he wanted to affect the ways in which the government manages the Amazon. Thus, Armando ventured into a political career. Having worked through positions in local and regional government over the last 15 years, today Armando represents the state of Pará in the Federal Senate, the upper house of the national congress. Armando is a proud member of the Worker's Party, a left of center party with a social and economic platform that resonates with the citizens of Pará who struggle to live in harsh working and financial conditions.

In the upcoming Federal Senate session, senators will vote on a bill to appropriate funds from an investment by the US of around $750 million (USD) to be distributed over 10 years as a part of the Amazon Fund organized by the Brazilian Government in 2008. As a well-liked senator from Pará with considerable expertise in forest ecology and management, Armando will be expected to weigh in on the bill. Armando's many responsibilities as a senator necessitate hiring advisors of different expertise to aid him in decision-making. Maria Duarte, Ph.D., is the new science advisor to Armando. Though raised in the large capital city of Pará, Belém, Maria completed undergraduate and graduate schooling in the US, studying the ecology of tropical forests. Regarding the upcoming Senate session, Maria argues that Armando should recommend putting the US funds towards creating a new swath of protected area in Pará resembling a US National Park. This, she argues, is the best and most ethical way to ensure the ecosystem remains intact for generations to come and to demonstrate to the US that funds are being used in an effective and discernible manner. Should resistance to this idea arise in the Senate, she notes that Armando could emphasize the global and regional ecosystem services offered by the forest to justify protection, though she feels the intrinsic value of the ecosystem is justification enough.

Before presenting her policy recommendations to Armando, Maria takes the liberty of replying to an inquiry from the Pará newspaper, *O Liberal*. Asked about Armando's response to the US investment, Maria states that she is recommending that he heed her suggestions: If so, "Pará will soon be home to a new, US-funded, US-inspired national park." *O Liberal*, however, misquotes Maria and reports that Armando has already agreed to Maria's plan for the US investment. Upset that Maria spoke to the press without permission, Armando reminds her that he is not obligated to follow her advice. Yet Armando understands that the press can occasionally take statements out of context to the point of miscommunication, so he allows the mistake so long as Maria promises to leave news communication to the press secretary in the future.

Though he loves the forest, Armando explains to Maria that there is more to the Amazon than the trees. The social system in Pará is deeply tied to the ecological system. Armando believes it is unethical to exclude humans from the forest and is doubtful a protected area restricting human use will be popular with his constituents or his Senate colleagues.

First, monitoring protected areas in the region is difficult. More money will buy more personnel, but Armando feels it is unlikely to halt violent encounters among police, illegal loggers, rubber tappers, and farmers. Second, Armando's constituents elected him on the Worker Party platform, hopeful that he could improve infrastructure and broaden economic opportunities. Investment in a protected area would be unpopular with citizens of Pará who rely on developing and using the forest for income. Armando is up for re-election at the end of the year. If he disappoints his constituents, he could lose his Senate seat. Finally, both his constituents and his Senate colleagues will be sensitive to attempted replication of a US National Park in Pará. Brazilians in general are wary of foreign influence, and particularly look out for foreign powers that threaten to "annex the Amazon forest unless the country can find something useful to do with it" (Economist 2009). Efforts by the international community to conserve the Amazon in Brazil are met with suspicion and frustration: "Do you care about us, or just our forest?" (Nordhaus and Shellenberger 2009, 61).

Armando has one month to deliberate with Maria and the rest of his team on a plan for the US investment. He will present his suggestions in front of the Federal Senate, a nationally televised event.

Discussion Questions:
1. Briefly summarize the competing interests involved in conservation of biodiversity in the Brazilian Amazon Rain Forest, categorized by scale (local, regional, global).
2. How would you describe the ethical stance of Armando Santos? Do you agree or disagree with his views? Why or why not? Summarize the competing interests he must manage in his decision. Which do you feel he should prioritize? Why?
3. How would you describe the ethical stance of Maria Duarte? Do you agree or disagree with her views? Why or why not? Provide a critique of Maria's argument to preserve the Amazon in Pará as a national park.
4. What is Maria's job as a science advisor? Is Maria performing her job as science advisor in a responsible manner?
5. Was it ethical for Maria to talk with the press without permission? To what extent does Maria bare responsibility for the reporter's error? Should Armando discipline her? Is there a positive lesson Armando can teach Maria about dealing with the press?
6. How can the US investment be appropriated to avoid tension in foreign relations?
7. How could the US funds be used to serve both economic and ecological interests?

Content Commentary:
In this case, Armando must consider competing interests among his constituents, colleagues, and advisors while being mindful of the myriad ethical dilemmas in which the forest is implicated. Here, we will consider the biodiversity and ecosystem services associated with the forest, the social and economic issues surrounding deforestation, and the options available to Armando as he makes his recommendation on how to use the US funds. Finally, we will explore the role of Maria as a science advisor and address her responsibilities, as well as her mistake in addressing the press.

The Amazon Rain Forest is the largest tropical forest on earth (6.7 million km^2 … eight times the size of Texas!); it contains more than half the planet's rainforests and record amounts of biodiversity. Brazil, the largest country in South America, encompasses the largest portion of the Amazon within its borders, particularly in the states of Amazonas and Pará in Northern Brazil. Although there is no current, official species count, Brazil likely contains around 50,000 species of plants alone, accounting for one-sixth of the earth's plant species (Myers et al. 2000). A 2005 estimate put the total number of species (plants and animals, both vertebrates and invertebrates) in Brazil at between 170,000 and 210,000 species, or approximately 9.5% the world total (Lewinsohn and Prado 2005). Deep

within the forest, it is easy to feel isolated from human issues, totally encompassed by wild nature. But the forest is very much central to social, economic, and environmental interests at local, national, and global scales.

In the last 50 years, around 20% of the forest cover has been lost to logging, development, and agriculture (WWF 2016, The Nature Conservancy 2016). Deforestation leads to loss of biodiversity, particularly through habitat loss and habitat fragmentation. Biodiversity loss in the Amazon can affect the global pharmacology sector, the regional tourism sector, and the scientists and environmentalists the world over who praise the intrinsic value of the unique and unparalleled plants and animals found there.

In addition to threats to biodiversity, the regional and global regulatory ecosystem services provided by the Brazilian Amazon are also in jeopardy. Plants in the Amazon contain between 90 and 140 billion tons of carbon (Soares-Filho et al. 2006). In perspective, human induced carbon emissions occur at a rate around 35 billion tons a year (and growing) (IPCC Report 2014). When trees are logged, the forest's capacity to absorb and hold CO_2 is greatly reduced. In particular, land use change for agriculture contributes to human emissions by burning off CO_2 contained within slashed and burned portions of the forest. In addition to being a carbon reservoir, the Amazon plays a crucial role in the water cycle. The forest recycles 25-50% of regional rainfall (Eltahir and Bras 1994), but large-scale deforestation could break the cycle and reduce average regional rainfall. The Amazon also impacts the amount of cloudiness, thermal insolation, land surface reflectance, atmospheric aerosol loading (which could effect *global* rain patterns), and surface roughness (affecting *regional* wind speeds) (reviewed in Malhi et al. 2008).

Besides regional and global ecosystem services, the forest holds local economic value to Brazilian citizens living in the forest. Though there are sustainable ways to live off of the forest, such as rubber tapping, many more people either directly or indirectly derive their income from logging. For example, in Tailândia, Pará, 70% of the 25,000 people living in the city depend financially on deforestation in some way (Economist 2009). Loggers take the best and most valuable trees for their lumber business, while farmers and cattle ranchers depend on cleared lands for their agricultural purposes.

Social issues in the forest abound. In the 1960s through the 1980s, the Brazilian government subsidized the mass migration of citizens into the forest in efforts to begin economically utilizing the country's vast interior (Economist 2009; Nordhaus and Shellenberger 2009). However, once citizens moved into the forest, promises of free land and prosperity were met only for the lucky few. Members of the elite class bought land ahead of the mass migration, and to demonstrate ownership they immediately began to log and burn the land. Still today, the top 1% of affluent landlords oversees 45% of the land (Nordhaus and Shellenberger 2009). And "only 14% of privately owned land is backed by secure title deed," while the rest is backed with fake documents (Imazon study quoted, Economist 2009).

Many low-income families living in the forest are forced to work in harsh conditions governed largely by landlords, gangs, poachers, and illegal loggers (Garcia-Navarro 2015; Economist 2009; Nordhaus and Shellenberger 2009). It is said, "the law of the Amazon is made by the bullet" (Nordhaus and Shellenberger 2009, 49). For example, a recent NPR report details the ongoing "war over wood" between rubber-tappers and illegal loggers in protected portions of the forest. Illegal loggers are barely penalized, due to a lacking and understaffed police force. When rubber tappers who depend on the intact ecosystem encounter loggers, arguments are settled with bullets, knives, and murder. Rubber-tappers fight to defend their way of life. Loggers not only fight to protect their illegal jobs, but also their own lives. Many are impoverished and treated no better than slave laborers, overseen by cruel gang lords who run the illegal logging operations (Garcia-Navarro 2015).

Finally, there is a long history of fear over foreign involvement in Brazilian affairs. Nordhaus and Shellenberger (2009) summarize:

> "As a country of great artists, architects, diplomats, designers, and engineers, and as people who speak Portuguese in a region where Spanish dominates, Brazilians justifiably see themselves as special and unique. At the same time, many Brazilians are ashamed of the persistence of widespread poverty, violence, and lawlessness… This stew of national pride and shame results in

> Brazil's love-hate relationship with the United States. Environmentalists' efforts to reassure Brazilians that their attempts to save the Amazon are in Brazil's best interests not only fail to assuage Brazilian concerns, they trigger Brazil's fear of being patronized…

> Brazilians continue to see environmental proposals [such as working with US funds to establish a new national park] as suspicious. …Brazilians ask themselves … 'Do you care about us or just our forest?'" (60-61).

Armando will consider these multi-scale social, economic, and environmental interests as he decides how to recommend using the US funds. He must also manage input from his constituents, his Senate colleagues, the US government, and Maria and his other trusted advisors. His personal compass further complicates his decision. Armando's anthropocentric ethic and utilitarian view of the forest make him partial to social and economic interests. So although he is aware of the global and regional benefits of a protected area, his constituents have local, immediate needs that he feels more answerable to. Having grown up as a rubber tapper and having studied the forest extensively in school, Armando loves the Amazon, but he believes that people can co-exist with nature and there is no need for a national park that would restrict human use of the forest.

On the other hand, Maria's ecocentric ethic fuels her bias toward preservation of the forest, particularly for its intrinsic value. She would like the forest protected in pure form, free from human influence. Her US-based education may contribute to her admiration of the US National Parks. And having come from the large city, Belém, Maria is detached from the direct interactions between people and nature occurring at the border of and within the Amazon in Pará, such as in Tailândia. Thus, it is understandable that she would believe the best policy is to create a national park, and as an advisor she can provide this opinion to Armando. It is his decision whether or not to act on Maria's suggestion.

Maria should be able to perform her job as a science advisor despite her personal biases. It remains up to her how she elects to use her expertise. For example, Maria might choose to be an "Issue Advocate," and "[focus] on the implications of [her] research for a particular political agenda" (Pielke 2007, 15). In the case study above, she did just that, aligning her policy suggestion to her ecocentric ethic and using media outreach to push her agenda. Maria could also be an "Honest Broker," with a responsibility to provide information regarding a suite of different policy alternatives and how they will effect or be affected by the state of the forest. A politician or the political process (e.g., popular vote) takes on the responsibility of making a choice among the alternatives (Pielke 2007, 17). Armando's negative reaction to Maria's media statement and his disapproval of her narrow vision for a policy suggestion alludes to his preference for science advisors that act as "Honest Brokers."

There is also a workplace authority problem in this case. It is possible that Maria could advocate her position and Armando would not mind. But, whether Armando agrees with her recommendation or not, she should not be talking to the press without permission from her boss. Typically, institutions (including Armando's Senate office) have press secretaries that are charged with communicating to media outlets. Because she spoke to the press without a clear message, Maria and the reporter and editor at *O Liberal* who misunderstood her all share responsibility for the misquoted phrase. However, there is a possibility that the reporter did understand but decided to embellish the story. If that is the case Maria bears less responsibility, but speaking via a press secretary may have helped, as press secretaries are knowledgeable about how to communicate clearly and consistently with reputable news sources. If in the future Maria is allowed to speak directly with the press, she should be honest and she should be clear that her statements in no way reflect the as of yet unannounced opinions of Armando or any other members of Armando's team. The press secretary will release statements that represent the views of the institution as a whole.

Considering that Armando does not plan to adopt Maria's vision of a national park, below are a few alternative policy options that are more in line with Armando's desire to both protect the forest *and* support his constituents with the funds (by no means, an exhaustive list). An "honest broker" analysis by a Maria might have revealed some of these policy alternatives. Note that many of them are not strictly scientific, an indicator that it may also be the job

of a science advisor to collaborate with experts and advisors of different expertise to come up with a more thorough and inclusive field of potential policies.

Although law enforcement efforts in the forest have increased in recent years, "the basic factors driving deforestation — including poverty and the profitability of agricultural land — have not changed" (Tollefson 2015). To address these "basic factors," Armando could use the funds to invest in local economic issues. For example, investing in public education and stimulating creation of service-economy jobs could help to eliminate the need for a logging-derived income. Another option, subsidization of advanced faming equipment, could preclude the need for slash and burn agriculture. Armando could also advocate using the funds to bolster efforts to put together a rural land registry in Pará (Tollefson 2015). A land registry could aid in easing violent disagreements over land ownership and allow the government to more easily enforce land-use laws. These locally minded suggestions would also be appealing to Brazilians who would like to minimize replicating or depending on the American environmental movement.

Funds could also be used for a "payment-for-ecosystem-services" (PES) scheme for the farmers within Pará. Such a scheme would reward farmers for keeping parts of the forest that fall within their property intact. For example, a farmer could be paid for the economic hit they take for not planting on a forested portion of their property. However, PES schemes are difficult to implement (e.g., how do you decide the value of the intact forest? How do you monitor the scheme?), and an Amazon forest PES scheme may only benefit large land owners because they are the ones who own the majority of land (or at least appear to own the majority of land based on documents, both legal and fake) (Börner et al. 2010). PES schemes could also be internationally scaled, such as REDD ("reducing emissions from deforestation and forest degradation"), in which foreign countries pay Brazil to keep the forest intact to prevent the carbon emissions associated with deforestation. In 2015, Norway paid the last installment of an unprecedented $1 billion investment in the program. However, Brazilian farmers and local programs complain that they've seen few direct benefits from the REDD program (Tollefson 2015).

Another idea, Armando could use funds to advertise and implement a boycott of products and goods that are implicated in deforestation. For example, initially backed and promoted by the international environmental organization, Greenpeace, the Soyabean Moratorium is essentially an agreement among soyabean exporters (led by McDonald's) to cease buying from growers in the Amazon and to fund monitoring programs to ensure the success of the moratorium (Greenpeace 2016; Tollefson 2015; Economist 2009). The moratorium appears successful thus far. A 2015 study found that deforestation was higher in areas not under the moratorium, compared to those that were (Gibbs et al. 2015). Funding could potentially be used to maintain and expand the soyabean moratorium, or to replicate it in the cattle or logging industries.

What remains for Armando, is to decide which of the options (among these and among others) he thinks could be successful and desirable. Then he will advocate his selection to his colleagues and constituents in the upcoming Federal Senate session.

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Links:

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Greenpeace:
http://www.greenpeace.org/international/Global/international/code/2014/amazon/index.html

REDD:
http://theredddesk.org/what-redd

The Nature Conservancy:
http://www.nature.org/ourinitiatives/regions/southamerica/brazil/placesweprotect/amazon.xml