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Impacts of Infrastructure Related to Tourism on Machu Picchu

Each year millions of people from around the world travel to new and exciting destinations. These world travelers go off to every corner of the globe hoping for an experience that will bring adventure, exposure to new and different cultures, and for some people, just the opportunity to escape the monotony of every day life. Whatever the reason for their travel these tourists represent a growing global industry and many countries advertise the variety of opportunities that a trip to their particular country would provide. However, with the growth of the tourism industry comes an increase in impacts that tourists have on the countries they are visiting. One country that has experienced a significant increase in tourism is Peru. Over the past few decades the number of tourists visiting Peru each year has grown to over one million people (Smith and Hurt 2011). Peru is home to several unique cultural and biological sites that bring tourists from around the world. Peru's most popular tourist attraction is the ancient Inca site of Machu Picchu. Since its discovery in 1911, the Machu Picchu region of Peru has experienced a significant increase in infrastructure, most of which has been related to tourism. This paper examines how the introduction of tourism and infrastructure has impacted the Machu Picchu region of Peru and the implications these impacts have for other historical sites. By using the framework of political ecology, this study examines the tourism industry in Machu Picchu and the potential for a shift in the current system towards more sustainable tourism practices.

In 1911, when Machu Picchu was discovered by Hiram Bingham there were no roads or railways leading to the site. For many years the only way to reach the site was by hiking along the Inca trail (Figure 1). The trail is 50km long and can be hiked over the course of 3-5 days (Bauer 2003). Since the 1930's there have been several infrastructure projects constructed with the goal of increasing tourism to the region. Among these projects are a railway that transports tourists from the city of Cuzco to Machu Picchu, a road that was constructed from the train to the ruins, several hotels, as well as the incorporation of restrooms and other infrastructure along the Inca trail (Maxwell 2009). Along with the construction of these transportation systems there have been other

suggested projects such as the incorporation of a cable car to take visitors to the top of Machu Picchu. However, this project was met with major opposition and was eventually discarded (Maxwell 2009). Since the incorporation of these infrastructure projects, tourism to the Machu Picchu region has skyrocketed. Each month more than 68,000 people visit the ruins of Machu Picchu (Smith and Hurt 2011) with the annual number of visitors reaching 858,000 (Maxwell 2009). This enormous increase in the number of visitors to the region has major impacts on both the local population and the environment.

Looking at the impact of tourism on an area such as Machu Picchu is important because it highlights aspects of the current system that have negative social and environmental impacts. Addressing these issues allows for the implementation of more sustainable methods of tourism. Successfully implementing sustainable methods of tourism would reduce the negative impacts tourism has on the environment and local populations. The ultimate goal of reducing negative impacts to Machu Picchu would be to introduce a form of ecotourism. According to Vincent and Thompson (2002), ecotourism is the fastest growing form of tourism with growth rates of 10- 30% annually while the tourism industry grows at a mere 4% annually. Ecotourism is defined as “responsible travel to natural areas, which conserves the environment and sustains the well-being of the local people” (Vincent and Thompson 2002). There are several characteristics of ecotourism that can be used to differentiate ecotourism from regular “mass tourism”. These characteristics include: a minimal impact on the local environment, a commitment to environmental protection and the protection of local resources, the generation of money to go towards sustaining local resources, active involvement by local community members, and economic and social benefits for the local community (Vincent and Thompson 2002). Tourism in Machu Picchu incorporates some of these characteristics but there are still some aspects of tourism in Machu Picchu that need to be restructured in order for tourism to be considered ecotourism.

Ecotourism emphasizes a minimal impact on the local environment and a commitment to preserving environmental resources. The Machu Picchu region of Peru is known for its incredible biodiversity, “The southwestern Amazon is a biodiversity ‘hotspot’ and the Andes-Amazon interface has particularly high species diversity” (Mendoza et al. 2007), the region is home to over 50,000 plant species, 400 species of butterflies and 1,750

different bird species (Smith and Hurt 2011). In order for tourism in this region to be considered ecotourism, the impact on the local environment must be kept to a minimum. This has not been the case. Since its introduction to Machu Picchu there have been numerous ways in which tourism has led to the degradation of the local environment. The increase in visitors to the site has put a strain on the waste management system of Machu Picchu and restrooms have had to be constructed along the Inca trail (Maxwell 2009). The issue of insufficient waste management in areas due to an increase in tourism is not unique to Machu Picchu. Stonich (1998) cites several studies that have looked at the relationship between tourism development and its impact on water quality and human health. A study of the Bay Islands, Honduras revealed improper waste disposal could have profound impacts on the quality of local water (Stonich 1998). This study went on to conclude that one of the most threatening concerns to water quality and human health is pathogen contamination caused by improper disposal of human waste (Stonich 1998). In a separate study on the Sikkim region of the Himalayas, researchers looking at the impacts of tourism found an increase in waste along the trails that were most commonly hiked (Rai and Sundriyal 1997). The same study revealed local timber resources were overharvested due to increasing tourism demands. Large sections of forest were cleared so that the wood could be used by guides and tourists to fuel their fires (Rai and Sundriyal 1997). As the tourism in the region increased, so did the demand for firewood. This resulted in an unsustainable amount of trees being cut down. These results are representative of the environmental damage that comes with increased access to wilderness areas for tourists. The Sikkim region is very similar to the Machu Picchu region in that the main trails are seeing an increase in human waste and local resources are being exploited to make room for a growing tourism industry. The impact that these roads and paths are having on the environment must be addressed in order for a sustainable form of tourism to be implemented.

Another characteristic of ecotourism is an active involvement of local community members. This is of particular importance because previous research has shown that “if local people reap direct benefits from protecting their surroundings, they are more likely to go on to protect biodiversity, nature, and cultural heritage” (Rai and Sundriyal 1997). In this sense, the introduction of new infrastructure helps to facilitate local involvement by

providing jobs and income to members of the local community. Since the construction of the Machu Picchu railway in 1940, it has provided economic benefits for local communities, “Men worked on the trains and rails, and women sold food and produce to people who came from Cuzco or Quillabamba” (Luciano 2011). With the introduction of tourism the population has grown even more. People saw the opportunity for making a profit and moved to Machu Picchu. This trend is summarized by the findings of Luciano (2011) that states “locals and their activities are motivated primarily by economic incentives created by the tourism economies often generated by protected areas”. As more and more people move to Machu Picchu, the capabilities for tourism are increased which allows for more economic benefits for the local community.

Today tourism has become such a large staple for the local economy that when a debris flow wiped out large parts of the railroad track in February of 2010, an estimated 15,000 people were out of work and losses were estimated to be about one million dollars each day that the railroad was out of commission (Smith and Hurt 2011). The possibility of landslides is therefore a major factor to consider when thinking of the local economies. Prior to the debris flow in 2010, Sassa et al. (2002) conducted a study to investigate the possibility of future landslides in the area. The results of these study indicated that landslides are related to the amount of permeable surface that can help reduce runoff, which is a major contributor to landslides. These findings show that while the construction of infrastructure such as roads and railways can be beneficial to local communities, too much infrastructure can have a detrimental effect on both the environment and the livelihoods of local community members. Careful planning is necessary to strike a balance between the increase in infrastructure and the limits of the local environment in order to provide the maximum benefit for local communities.

Another characteristic of ecotourism that must be considered when analyzing the sustainability of a tourism industry is the creation of social and economic benefits for local people. Studies indicate that while tourism has the potential to generate economic and social benefits for local communities, a disproportionate amount of those benefits go to wealthy foreign investors while most of the cost is absorbed by local community members (Stonich 1998; Adams and Hutton 2007). In the case of Machu Picchu there is a large divide in who benefits from tourism in the region. “Each day more than 1,500 people trek the

ancient Inca trail to the ruins and another 4,000 tourists arrive by train and walk the walls and paths of the site” (Wallace 2005). Tour agencies hire local men to act as porters along the Inca trail. These porters are in charge of transporting the tourists’ belongings, food, medical supplies, and anything else they may need for the 3-5 day hike to Machu Picchu. In addition these porters act as guides and cooks for the duration of the expedition. A study of the health and working conditions of porters on the Inca trail revealed that porters can be anywhere from 17 to 68 years old (Bauer 2003). During this study many porters were interviewed and asked about the conditions under which they normally work. The observations of the researchers and the results of the interviews revealed the terrible working conditions that many of these porters are forced to deal with. Many did not have adequate food, clothing, medicine, or supplies for their journey and on top of that were required to work almost 18 hours a day carrying a pack that weighed anywhere from 20-45kg (Bauer 2003). The exploitation of these workers is an example of how access to roads and trails such as the Inca trail can lead to the exploitation of local workers while tour agencies reap the benefits from afar.

Another example of the unequal distribution of benefits in Machu Picchu is the railway, which takes tourists from Cuzco to Machu Picchu. *PeruRail* is a London based Orient Express Corporation, which is the single largest private entity operating in Machu Picchu (Luciano 2011). While the railway takes some of the pressure off of the porters by offering an alternative form of transportation, the foreign company receives the profits from people using the train. Luciano (2011) points out that a majority of the profits from tourism in Machu Picchu go to companies in either Cuzco or Lima. With these companies receiving a large portion of money generated by tourism it provides little economic benefit for local people. The impacts of this tourism related infrastructure has a negative impact on the economic wellbeing of the local population. This is not sustainable and in order for this operation to be considered ecotourism the social and economic benefits for local people must be considered.

While the impacts of tourism on local populations in Machu Picchu have been extensively studied and documented this particular research paper will address the gaps that exist in prior research by analyzing the impacts of tourism at Machu Picchu and determining the implications that an increase in tourism would have on similar historical

sites. Using the framework of political ecology this study identifies what needs to be done in order to make tourism in Machu Picchu more sustainable and what is required to make the switch to ecotourism. This paper suggests ways ecotourism can be better implemented at other historical sites as tourism spreads throughout Peru and the rest of the world.

Political ecology began as a way to bridge the gap between social and natural sciences. Until the emergence of political ecology, social and natural sciences were two different approaches to understanding social and environmental issues. One major difference between social and natural sciences is that “social science integrates politics within its analysis of conservation; natural science typically places it on the outside” (Adams and Hutton 2007). Adams and Hutton (2007) mention several examples of how political ecology combines aspects of both social and natural science and “offers productive possibilities for developing understanding of political dimensions of conservation”. This combination of social and natural sciences allows for a more complete understanding of the causes behind environmental degradation due to tourism. These relationships between social, political, and environmental conditions must be considered when planning for successful ecotourism. Belsky (1999) examines community-based conservation efforts and rural ecotourism in Gales Point Manatee, Belize. His study of the ecotourism industry in Gales Point reveals that while the system might appear to be working, it is incredibly unstable and is compared to a house of cards. The source of this instability, Belsky found, was an unequal distribution of the benefits from ecotourism to local community members. The income from ecotourism was “too sporadic, insufficient, and concentrated among a few households and individuals to make much difference in village livelihood security” (Belsky 1999). By using political ecology as a lens through which to analyze tourism in Gales Point, Belky was able to gain a better understanding of what issues are causing the instability that he observed. Although the environment was suffering, the root of the problem was not insufficient conservation efforts. Rather, the social conditions related to the unequal distribution of benefits from tourism were causing local people to abandon conservation efforts. The social and political conditions in Machu Picchu are therefore important to consider when analyzing the potential for ecotourism in the region today.

Understanding the scope of any problem is essential to being able to fix it. Political ecological analysis consists of an integrated explanation of human-environmental

interactions linked through different scales from the international/global to the local (Stonich 1998). Tourism is a global industry and therefore global interests must be considered when studying the impacts of tourism. “Essential elements of political ecological analysis encompass the ideologies that direct resource use and influence which social actors benefit and which are disadvantaged” (Stonich 1998). Earlier in this study the unequal distribution of benefits among local people was discussed regarding the presence of foreign investors in areas with tourism industries. The unequal distribution of benefits is demonstrated by Belsky (1999) when he discusses the problems associated with ecotourism in the Gales Point Manatee region of Belize. In this region, pressure from state and foreign agencies led to conflict among local people. Rivalries between the state and local communities arose because the benefits coming from the tourism industry were not equally distributed among local people (Belsky 1999). Conflicts between the state and local communities arise because tourism is a resource. Like any resource, there is a struggle among many stakeholders for control. When foreign investors and state run programs become involved in this struggle for resources it often results in a lack of benefits for local people. In the case of Machu Picchu, state development projects and foreign investors entering the tourism market have made it difficult for local community members to receive the economic and social benefits generated by tourism in the area. This problem originated when Peru’s economic policies shifted towards a liberal free market, which emphasizes state deregulation of economy, privatization and attracting foreign direct investment (Luciano 2011). This emphasis on attracting foreign investors has caused many local people to be cut out of the tourism market. The new economic situation in Peru has led to “greater competition at the local level and an increase in the tendency to blame locals for conservation problems which became a part of the effort to create and guarantee more operating room for larger capital investors” (Luciano 2011). Today, foreign companies control the railroad, which transports tourists to and from the site of Machu Picchu. Large luxury hotels have been built at the site, and many of the tourists travelling through the area choose to use tour agencies located overseas or in one of Peru’s major cities such as Cuzco or Lima (Luciano 2011). Using the framework of political ecology helps to highlight the impact that Machu Picchu’s introduction into the global tourism market has had on local economic, social, and environmental conditions.

The framework of political ecology combines important aspects of social and natural sciences that create an opportunity to analyze the potential for sustainable tourism and ecotourism. This analysis carefully examines the political ecology of ecotourism through an analysis of tourism and its impacts to the Machu Picchu region of Peru. In order to perform this analysis this study uses the six characteristics of ecotourism as described by Vincent and Thompson (2002) as a model for successful ecotourism. Using the framework of political ecology each characteristic is applied to Machu Picchu. Performing this analysis indicates what impacts tourism has on the local community and local environment in Machu Picchu. The results of this analysis indicate the areas of tourism in Machu Picchu that must change in order to be considered sustainable. The use of political ecology in this analysis helps to illustrate the scale of these problems and what social actors are involved. Finally, this paper uses the analysis of ecotourism in Machu Picchu and offers possible solutions that will allow for more sustainable forms of tourism to be planned and implemented. This study has important implications not just for Machu Picchu but for other emerging tourism industries as well. It highlights the social, political, and environmental factors that must be considered when planning for ecotourism. The results of this study present the possibility for sustainable tourism to be implemented in Machu Picchu and many other emerging ecotourism locations in the future. As the global tourism industry grows, and tourism expands to new areas, it is important to consider the social, political, and environmental factors highlighted by this study.

In order to determine the impacts that tourism and infrastructure related to tourism have had on the Machu Picchu region of Peru, this study examines data collected from several different sources through the framework of political ecology. The synthesis of natural and social sciences presented by political ecology allows for a better understanding of the complex issues presented by tourism and its impacts in Machu Picchu.

Vincent and Thompson (2002), list five characteristics that constitute ecotourism. These characteristics include: a minimal impact on the local environment, a commitment to environmental protection and the protection of local resources, the generation of money to go towards sustaining local resources, active involvement by local community members, and economic and social benefits for the local community. This study examines the characteristics of ecotourism as they apply to Machu Picchu, and analyzes each of them

through the framework of political ecology. By performing this analysis this study highlights the positive and negative impacts that the development of Machu Picchu's tourism industry has had on the region and indicates what needs to change in order to make tourism more sustainable. This study will also establish a framework that can be used when planning future development in sites similar to Machu Picchu in order to ensure that future tourism development is implemented in a more sustainable manner.

The first characteristic of ecotourism is a minimal impact on the local environment. While the entire southwestern Amazon is known to be a "biodiversity hotspot" (Mendoza et al. 2007) the Machu Picchu region in particular is home to thousands of different plant, animal, and bird species. The high level of biodiversity in such a concentrated area makes limiting the impacts related to tourism very important when planning future development. As the tourism industry continues to grow in the area, the impacts on the local environment increase as well. The Inca trail (figure 1) is one of the major tourist attractions of Machu Picchu and as such it is very susceptible to environmental degradation. In 2008, over 141,000 people made the 3-5 day hike along the Inca Trail (Maxwell 2009). The enormous amount of tourists moving along the Inca Trail has had a significant impact on the local environment. Agusti (2003) examines the environmental impacts of this increase in tourism. Her study cites three main issues as the major causes of environmental degradation in the area. These issues were deficient solid waste disposal, water pollution due to improper waste disposal and lack of infrastructure, and a reduction in vegetation cover along trails and around campsites (Agusti 2003). As the issue of improper waste disposal became more and more apparent over time, the local government constructed restroom facilities in order to try and alleviate some of the pressure put on the local environment (Maxwell 2009). Even after the construction of restrooms, waste disposal still remains a serious issue when trying to reduce the impact of tourism on the local environment. While the human interactions with the environment are a major part of this issue, there are social factors that must be taken into account as well. Agusti (2003) explains that many of the issues contributing to environmental degradation along the Inca trail seem to be the result of a lack of education and training in both the tourism agencies and local people (Agusti 2003). The results of this study indicate that the problem does not just stem from an increase in the number of tourists hiking the Inca trail or from a lack of

infrastructure. Instead the root of this problem seems to be a lack of education. Therefore in order to make the shift towards more sustainable tourism in Machu Picchu several changes must be made to the current system. In order to reduce the impact of tourism on the local environment in Machu Picchu, new infrastructure must be put in place to meet the increasing demands for waste disposal along the Inca trail. Also, educational programs must be set up for tourism agencies, local populations, and tourists, which will educate people about reducing their impacts on the local environment. Incorporating such a system in Machu Picchu will help to alleviate the pressure of waste disposal caused by an increasing number of tourists. A system of education will also ensure the second characteristic of ecotourism, which is to create a commitment to environmental protection and the protection of local resources.

Another aspect of ecotourism is an active involvement by local community members. Machu Picchu's population has grown significantly since the introduction of tourism and the construction of the rail line that connects Machu Picchu with urban areas like the city of Cusco (Luciano 2011). As the population of Machu Picchu increases so does the importance of getting local community members actively involved in tourism. It is important to get locals involved because without local support and involvement, local residents will have no incentive to preserve the environment. In many instances, not just in Machu Picchu, a lack of local involvement can have detrimental effects on conservation efforts. In the case of Sikkim, in the Himalayas, local residents chopped down large sections of forest to use for fuel for campfires, cooking, and other essential functions related to tourism (Rai and Sundriyal 1997). As tourism increased in the area locals saw an opportunity to make a profit by harvesting timber. Since there was no incentive for them to participate in conservation, the local community members cut down large sections of forest to be used for tourism. This is similar to the situation in Machu Picchu. Many of the local residents cut down large sections of forest to use the wood for fuel or to clear the land for livestock. As the population continues to increase in Machu Picchu it is important to get community members involved in preserving local resources because without resources tourism would be impossible. Examining this issue through the framework of political ecology helps to identify some of the social factors contributing to the problem. Tourism in Machu Picchu is already one of the major sources of income for families. In the town of

Machu Picchu, most of the “economic activity takes the form of family-owned enterprises such as restaurants, hostels, and artisan/merchants who sell ceramics, textile products, and memorabilia tailored for tourist consumption” (Luciano 2011). In this regard the impact that tourism has had on local involvement in tourism is a positive one. However, with the increasing population due to tourism it is important to monitor and plan future urban development. While many of the local people are actively involved in the tourism industry and reap some of the economic benefits of participating in the market, there are still local people in the Machu Picchu region who are not actively involved in tourism and whose actions pose a threat to the local environment and the tourism industry. In some more rural areas, “local timber activities, as well as agricultural practices, may fragment the forest, causing the loss of native species such as the spectacled bear (*Tremarctos ornatus*), monkeys, birds, and orchids” (Agusti 2008). It is very important to the health of the environment and the tourism industry for these people to reduce their impact on the local environment especially because it poses a direct threat to the biodiversity of the region. In order to solve this problem it is important to first consider its causes. In the case of Machu Picchu the people who are clearing these forests for farming and other uses are the rural poor. Studies on the causes of this land degradation indicate, “environmental destruction identified with the economic production systems of the poor usually is an outcome of their impoverishment either absolutely or relatively to other social classes” (Stonich 1998). Therefore the poor community members that are causing this environmental destruction are only doing so because they have no other means of income. The logical solution to this problem would be to provide an alternative that would benefit both local populations and the environment. One appropriate alternative would be to implement a system of community based conservation. Advocates of this type of system propose that conservation can best be achieved by giving rural people a direct economic interest in the survival of the species (Adams and Hutton 2007). Zoe and Harrison’s (2010) study of turtle conservation in Costa Rica they found that by involving local fishermen in the tourism industry, they were able to reduce the pressure on turtle populations from fishing. In this case turtle fishermen in Costa Rica became involved in the tourism industry by leading turtle spotting tours. With an alternative source of income fishermen switched their occupation from turtle fishing to turtle conservation. While fishing practices are not an issue in Machu

Picchu, a similar alternative could be created for the people of Machu Picchu in order to give people an incentive to shift their practices from environmental degradation to environmental preservation. For example, if these poor rural farmers were given the opportunity to lead guided tours through the historical site or help to protect against poaching and other illegal activities, it would provide the farmers with an alternate source of income. The opportunities for a shift in occupation will not only ensure local involvement, but also the money generated by the tourism industry will then go toward sustaining local resources.

The final characteristic of ecotourism is the generation of social and economic benefits for the local community. One of the major issues with tourism in Machu Picchu and similar tourist sites is that the benefits of the tourism industry do not go to local populations. A study on the Sikkim region of the Himalayas found that “a huge amount of foreign investment goes to travel agencies and most of the tourists visit the area in organized groups and make little demand on local services” (Rai and Sundriyal 1997). The study went on to say that of all the money spent on travel to Sikkim, “only 10-12% is spent within Sikkim for hotels/lodge, package tours, goods, and other services which leaves nothing for local people” (Rai and Sundriyal 1997). This system does not meet the characteristics of ecotourism as economically benefitting local people. A similar disconnect between the money from tourism and the local populations exists in Machu Picchu. In Machu Picchu most of the tourists who do not wish to make the 3-5 day hike along the Inca trail opt to take the train. (Figure 2) “The single largest private entity operating in Machu Picchu is the London- based Orient Express Corporation which runs the *PeruRail* train that transports tourists through the sanctuary, in addition to owning luxury hotels there” (Luciano 2011). With an English company owning the railway and the hotels and foreign travel agencies receiving a large portion of money from tourism, the economic benefit for the people of Machu Picchu is very limited. In order for a more sustainable form of tourism to operate, a shift must be made to direct more money from tourism into the local economy. In order to make this shift the government of Peru needs to limit the access to Machu Picchu by foreign investors such as Orient Express and other tour agencies that have cut local people out of the tourism market. In order to do this the state must help local tour operations by helping to fund new infrastructure that will increase tourism. This

system was implemented in the 1970's when the state provided 70% of the funding necessary for the construction of new roads, airports, and transportation services (Luciano 2011). Funding these infrastructure projects through the state reduces the involvement of wealthy foreign investors and gives local populations a chance to get involved in the tourism market. The planning for these projects could be done in a way that has the least environmental impact and jobs would be created for local people both during and after the construction of the new infrastructure. This will help to benefit local people and will help to introduce Machu Picchu to the global economy (Rai and Sundriyal 1997).

Another major issue with the tourism industry in Machu Picchu is the lack of social benefits for local community members. Many community members, particularly the porters that work on the Inca trail, work long hours in unfavorable working conditions for very low wages. Bauer (2003) interviewed 101 porters to find an overwhelming number of the porters operating along the Inca trail lack sufficient food, shelter, and other provisions. Not only do these porters work long hours under terrible conditions but the wages that they earn are very low. Bauer's (2003) study identified several reasons that explain the poor conditions that these porters work in: no local office for public health authorities, a lack of organization by the porters, and disconnect between foreign travel agencies and local employees. In order to rectify the situation regarding poor health of the Inca trail porters several changes must be made. The first step towards improving the conditions for the porters is to create a well-established public health authority in charge of protecting the rights of local people. This authority could help improve the porter's workload as well as make sure that porters receive fair compensation for their work. Another change that would help to increase the social benefits of tourism for local people would be to organize the porters. Increasing awareness of the problems surrounding porter health and the need to protect porters has led to the creation of groups such as the International Porters Protection Group (IPPG) that focus on increasing benefits for porters around the world (Bauer 2003). If a group such as the IPPG campaigned for porters on the Inca trail it could result in increased benefits for the local population in Machu Picchu. Finally, the tourism agencies responsible for hiring these porters need to be held more accountable for providing porters with sufficient materials and wages. The disconnect that exists today between porters and the agencies that hire them causes many of the health problems that

exist in the tourism industry. If these changes are made, it is possible to increase the social benefits for local people in Machu Picchu and make the shift toward more sustainable methods of tourism.

The development of the tourism industry in Machu Picchu has had a profound impact on the local environment and the local people. While some of these impacts have benefitted local populations, many more have caused unnecessary environmental damages and have resulted in the unequal distribution of benefits between the rural poor and wealthy foreign investors. This study highlights several areas within the scope of tourism that need to change in order to make tourism in the Machu Picchu region more sustainable. As tourism continues to increase in the Machu Picchu region a shift must be made to reduce the impact of tourism on the local environment. A new system of waste management must be implemented along the Inca trail to deal with increasing pressures caused by an increase in the number of tourists visiting the areas. Other changes must be made to help get local people actively involved in the tourism industry. This could include a shift in occupation by local people from practices that require forest clearance to practices that help to benefit the local environment. Finally, tourism needs to shift toward a system that benefits local populations both socially and economically. The government should help to reduce the number of foreign investors involved in tourism at Machu Picchu by helping to fund infrastructure projects and favoring local tourism agencies. Tourism agencies need to be held more accountable for the working conditions of their local employees and need to play a more active role in stimulating the local economy. While making these shifts does not guarantee a perfect system of ecotourism, the changes in current practices will help to make tourism in the region more sustainable and reduce further impacts on the local environment and local communities.

While this study focuses on tourism and its impacts to Machu Picchu, its findings have implications for tourism in other locations as well. One site that has seen a recent increase in tourism is the Colca Canyon region of Peru. While this site is not a cultural heritage site like Machu Picchu, it is still threatened by the impacts of increasing tourism and infrastructure related to tourism. The Colca Canyon is one of the deepest canyons in the world and is twice as deep as the Grand Canyon (Smith and Hurt 2011). In addition to the spectacular views offered by the natural landscape in Colca Canyon, tourists frequently

visit *La Cruz del Condor* (The Cross of the Condor) overlook to watch Andean Condors as they rise into the air on the first thermals of the day (Smith and Hurt 2011). Although tourism in the Colca Canyon is nowhere near as popular as in Machu Picchu, tourism is slowly becoming a part of the local economy (Smith and Hurt 2011). As tourism continues to expand, it is important to consider the impacts that tourism had on Machu Picchu. The case of Machu Picchu shows that careful planning is necessary during the developing stages of tourism. Tourists visit the Colca Canyon in order to experience its natural beauty. In order to preserve this environmental resource and protect local species such as the Andean Condor (*Vultur gryphus*), a serious commitment to reducing the environmental impacts of tourism must be made when planning future development. The Colca Canyon is already being affected by new development related to tourism. Galas (2008) concludes that the biggest threat to the Colca Canyon region is uncontrolled tourism development. The findings of Galas (2008) are similar to the findings of this study on the impacts of tourism to Machu Picchu. Without careful planning and consideration of social, and environmental factors related to tourism development, there is a potential for serious environmental and cultural destruction in the Colca Canyon region of Peru. When planning for the development of tourism in the Colca Canyon, a commitment to reducing the environmental impacts of tourism must be made. In addition to this it is important to get local people involved in the tourism industry. Tourism is becoming a part of the local economy and has the potential to offer significant economic and social benefits to the people living in and around the Colca Canyon. In order to ensure that local people receive these social and economic benefits for the Peruvian government needs to regulate the presence of foreign investors and tour agencies. If a serious commitment is made to planning the development of tourism in the Colca Canyon, the local people and the local environment will receive enormous social and economic benefits from tourism.

Since its discovery in the early 1900's, Machu Picchu has become a major international tourist attraction. A lack of careful planning and concern for social and environmental conditions has led to the destruction of cultural and environmental resources that cannot be replaced. The construction of roads, a railroad, and luxury hotels by foreign companies has caused many local people to be cut out of the tourism market and placed enormous pressure on local resources. Looking at the potential for ecotourism

through framework of political ecology illustrates the need for more sustainable tourism practices in Machu Picchu. Political ecology allows for the consideration of social and political factors that contribute to the problems created by tourism. In addition to identifying social and political factors contributing to the impacts of tourism, looking at tourism in Machu Picchu on local and global scales allows for an in depth understanding of the different stakeholders that contribute to the problem.

Looking forward, there is a clear need for a shift towards more sustainable methods of tourism in the future. This shift is already being made in many places and annual growth rates for ecotourism are estimated to be between 10 and 30%. This is a very significant increase when compared to the annual average of 4% for tourism overall (Vincent and Thompson 2002). The expected contribution of baby boomers will continue to create an increase in demand for ecotourism in the future (Vincent and Thompson 2002). As the industry continues to develop and expand it is important to consider the characteristics of sustainable tourism in the planning and development of new areas. A continued emphasis must be placed on the preservation of biodiversity and a reduction of the impacts on the local environment. Most importantly, local communities must play an active role in tourism and its development (Wallace 2005). If these considerations are taken when planning the future of tourism it is possible to significantly reduce the negative environmental impacts of tourism while generating increased social and economic benefits for local people. This will create a new system of tourism dedicated to preserving unique cultural and environmental attractions for future generations.

Appendix



Figure 1: This map illustrates the location of the Inca trail in relation to the historical site of Machu Picchu.

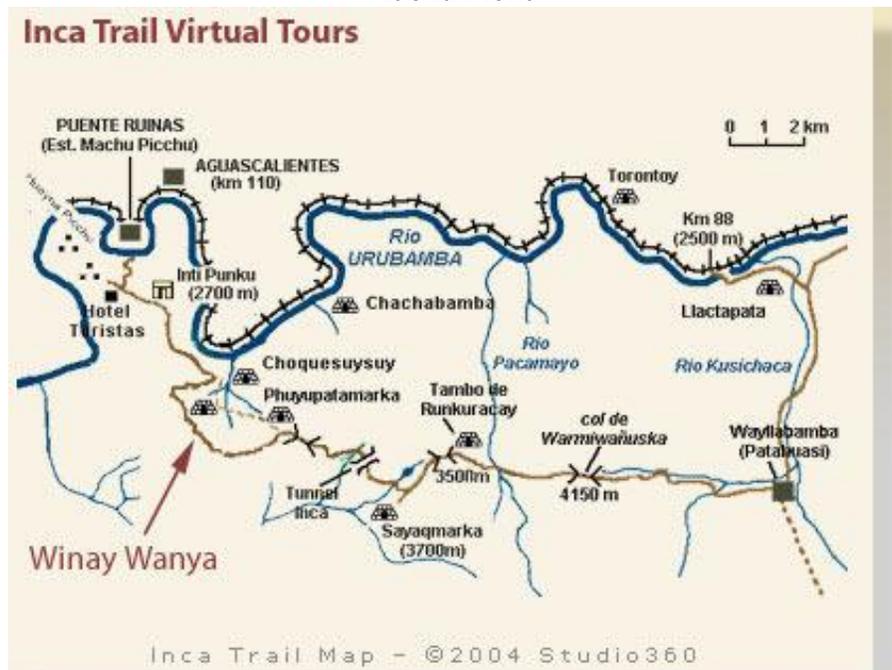


Figure 2: This map indicates the location of the Inca trail and the railroad to Machu Picchu.

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