

A Global Perspective on the Environmental Impact of Golf

Kit Wheeler & John Nauright

The sport of golf has grown tremendously in the past three decades. It is now the leading sport in the world in terms of total economic expenditure, yet surprising little on golf has appeared in the academic sports studies literature. In particular, the impact of golf on the environment has been virtually absent from discussion. Golf takes place in the outdoors, yet golf course development and maintenance has involved many aspects that are deleterious to the environment. This article charts the impact of golf on the environment from an international perspective, particularly noting emerging differences in first and developing world countries.

Introduction

The game of golf has enjoyed a remarkable period of growth around the world. Many participants see it not just as an opportunity to exercise and sharpen their skills, but also as a chance to do so while interacting with some of the most scenic environmental settings that can be found, particularly when playing a sport. It has been argued that no other sport ‘promotes the magical, Zen-like tonic of a walk in pristine natural surroundings’ in the way that golf does.[1] The relationship between golf and nature is long-standing, as courses are so often integrated with the surrounding landscapes, wildlife and vegetation.

Whatever it is about golf that appeals to potential players, it successfully reaches a wide audience. By 2003 the number of worldwide golfers exceeded 61 million, and over half of these participants are located in the United States.[2] The growth rate has been dramatic in the USA, as the number of golfers has ballooned from 11.2 million in 1970 to nearly 38 million in 2004. Of these, a core group of some 13 million can be classed

Kit Wheeler and John Nauright, Georgia Southern University, PO Box 8034, Hospitality, Tourism and Family and Consumer Sciences, Georgia Southern University, Statesboro, GA 30460, USA. Correspondence to: jnaurigh@georgiasouthern.edu

a regular participants.[3] Once deemed a sport for older, wealthy white males, golf has made inroads among groups it was originally thought to neglect within the USA: 45 per cent of golfers are between the ages of 18 and 39; females make up 4 per cent of the total number of golfers; African-Americans comprise 5 per cent of golfers; 4 per cent are Asian-Americans and 3.5 per cent are Hispanic-Americans. The rise in the number of golfers in the USA has necessitated a corresponding rise in the number of golf courses. As of 31 December 2002 there were 15,827 courses in the USA (11,501 of which are open to the public), which covered an area larger than 1.7 million acres, which is bigger than Delaware and Rhode Island combined.[4] Golf has also seen tremendous growth overseas, as there are now well over 25,000 courses worldwide, collectively covering an area close to the size of Belgium. Europe has been bitten hard by the golf bug and is now home to more than 5,000 courses,[5] while Japan has also seen extraordinary growth. Other parts of Asia are viewed as the new areas of market expansion of golf, with China and India seen as the next great untapped markets.[6] Indeed, China is now home to the world's largest single golf complex, the Mission Hill Golf Club and Resort near Hong Kong, which boasts 180 holes and covers some 7,700 hectares.[7]

Somewhat predictably, this explosion in worldwide participation has transformed golf into a multi-billion dollar industry that involves several transnational corporations associated not only with golf itself but also with overlapping businesses such as construction, agriculture, entertainment, hospitality, marketing and advertising. In the United States, golfers spent \$24.3 billion on equipment and fees in 2002.[8] Spending on golf equipment alone in 14 of the largest European golfing nations exceeded €1 billion in 1993.[9] In Japan, home to the biggest spenders per head in the global golf market, the combined value of golf memberships by 1988 already exceeded 10 per cent of the country's gross domestic product and by 2003 golf added \$14 billion to the Japanese national economy.[10]

Golf is seemingly poised to continue its extraordinary expansion across the world, but there is an increasingly significant cloud accompanying the silver lining of unimaginable profits. During the 1990s and early 2000s, concern developed over some of the detrimental effects associated with golf course development and operation. The public began to wonder about the chemicals used on golf courses and whether they may pose a health risk to humans and wildlife; about the water consumption that aids the production of the lush green courses so many players desire; and about the effects of course construction on the environment and the social ramifications that seem to be so often linked with golf courses.[11]

The peak of the global golf movement has coincided with the peak of the environmental awareness movement, and more people have become less tolerant of the impact that courses have. Developers are finding it harder and harder not only to find areas where course construction does not meet public opposition, but also to develop courses that meet, from an environmental perspective, with widespread approval. As a result, many are increasingly turning their attention to underdeveloped countries where the means to halt projects is less readily available, thus ensuring sustained profit generation. Other developers, primarily in the USA, Canada and Europe, have met

the concerns head on and have implemented a string of measures aimed at reducing the negative impact courses have both on the ecosystem and the community. Indeed, developers such as Greg Norman have approached the era of heightened environmental awareness by incorporating environmental issues into their corporate mantra. Norman's company links environmental concerns with profitability:

In recent years, all designers and developers have taken a more responsible approach toward the environment, and I'm proud that we often lead our development partners to more deeply explore issues pertaining to the environment and land planning. In addition to being fully conscious of environmentally sensitive properties that include wetlands or sites with endangered native plant life, we also spend considerable time in the design process identifying ways to utilize the greatest number of trees on a site, rather than eliminate them. Often, we establish routings that use these trees as turning points to shape a series of holes and offer suggestions to our development partners on how these woodlands also will enhance property values. It is not only our desire to create a great golf course, but also to find a perfect balance between maximizing the value of the residential component and creating a plan that is conducive to protecting its surroundings.[12]

Despite the growth of the sport and controversial issues related to its development, little has been written by sociologists of sport on golf and virtually nothing on golf and environmental issues.[13] The aims of this article are to begin to redress this imbalance through an examination of the environmental impacts that accompany projects that fail to take the environment at large into account; to discuss some of the implications for developing countries being targeted by money-hungry developers; to describe some of the ways in which the portrayal of golf by the global media has driven the growth of the game around the world while at the same time contributing to some of the problems with course operation; and to talk about some of the movements within the golf community that centre on lessening the detrimental results often seen and cited by environmentally-minded citizens and organizations. And although there have been some improvements in recent years, in part as a result of studies done in the 1990s, these have largely been confined to the developed world, while chemical use, land degradation, water-use issues and more still plague golf in the developing world.

'The Augusta National Syndrome': Media Influence on Golf Course Development

Before discussing specific environmental impacts caused by golf course development, it is important to place it in a social context. The role of the media and their portrayal of golf in the television age have been pivotal in shaping public perceptions of golf and expectations for the courses where golf is played. It is ironic to consider the role that the media have played in the global golf industry. On the one hand, they have promoted citizen awareness of the undesirable consequences that can accompany improperly focused golf course development. By creating and adding to the body of literature that highlights these impacts and what they mean to humans and all the components of their surrounding ecosystems, they have provided an incredibly

valuable service. But on the other hand, one must wonder where the global golf movement would be if championship golf played at what are seemingly quintessential courses were not being shown, promoted and advertised by television sets, sports programming and magazines around the world.

Golf traces its beginnings to Scotland over 500 years ago. Mark Keast (2001) describes the origins of golf course development as follows:

There, Mother Nature designed the links – grasses on sandy stretches were fertilized by the droppings of breeding seabirds and cut short by grazing rabbits. Bunkers were allegedly formed by sheep and other animals burrowing into the turf. The result: wide open playing areas with random clumps of razed grass, the perfect terrain for thumping a small, hard ball across the countryside.[14]

These original courses gave rise to a game that was shaped by the existing landscape, not a game that shaped the land. This was necessary, since many of the earliest courses did not charge fees for the use of what was then, and continues to be now, a shared community asset.[15]

Ideas about what golf courses should look like gradually began to change, but it was the jolt of televised events that truly provided impetus for major changes. Television showcased all 18 holes of a day's play for the first time during the 1960s, and courses have not looked the same since.[16] This phenomenon has been coined the 'Augusta National Syndrome',[17] named after the famous course that annually hosts what is arguably golf's most significant event, certainly the most significant at the same location each year. It further refers to the desire of participants, managers and superintendents to have the course they utilize most often resemble the magnificence of those captured in all their full-colour, high-definition glory nearly every weekend. Courses are designed to closely mirror those that host the best televised tournaments. What some people fail to realize, and what most people conveniently forget, is one simple fact, summed up by Keast: 'For any ordinary golf course to become as verdant as the grounds that host a prestigious televised golf tournament would require a chemical fog thicker than that used in the most intensive of agricultural operations.'[18]

Courses such as Augusta National are carefully monitored and treated throughout the year for those four days of global exposure each year. Very few people are aware that some of these famous courses will close for up to four months immediately following the event, just to repair the damage. It should come as no surprise that efforts to mimic the televised perfection offered to viewers will result in damage to the environment, and yet these standards that are also nurtured by features in golf magazines and resort ads continue to generate unrealistic expectations for many golfers. Owners, developers, designers and superintendents are placed under pressure to maintain immaculate courses by their clients, who may also be prone to grouse about less-than-perfect course conditions when they are paying substantial annual membership fees.[19] As a result, they are even more likely to turn to their trusted allies – water and chemicals – in an effort to produce the best course possible. These decisions simply feed back into an environmentally destructive loop, though they are

being more frequently questioned as more and more people begin to wonder about their ultimate ramifications.

An Overview of Golf's Environmental Impacts

At a distance, golf is a seemingly innocuous, perhaps even favourable, avenue for land development. The courses represent a positive recreational use and sound environmental management. They also would seem to provide ample wildlife habitats. The turf found on golf courses can serve to protect the underlying soil from water and wind erosion while absorbing water that will ultimately serve to maintain regional supplies. Because golf is inextricably linked with nature, the most scenic natural sites are favoured for course construction – this includes areas near scenic rivers, lakes and oceans, land adjacent to pristine forests, and parcels at the base of towering mountains.[20]

It is now known that golf course construction often consists of some or all of the following practices that can be extremely deleterious to the surrounding environment: clearing of natural vegetation, deforestation, destruction of natural landscapes and habitats and changes in local topography and hydrology.[21] The clearing of trees and vegetation leads to gullying and erosion, which in turn increases sediment loads in runoff to nearby bodies of water.[22] It has been said that erosion during course construction can damage the flora and fauna of lakes and streams as much as other building projects.[23] Deforestation also renders land more prone to the effects of erosion. Additionally, it results in an increased flux of dissolved ions and nutrients, which can lead to downstream nutrient enrichment and unwanted algal blooms.[24] Alterations to local topography and hydrology will change the quantity and chemistry of runoff to streams, rivers and lakes.[25]

During construction of the Meadow Springs golf course in Jefferson, Wisconsin, for example, storm water flowed into the Rock River during construction. The course developers were subsequently cited for failing to obtain a permit to discharge storm water from a construction site and failure to develop and implement an erosion control plan. In addition to the fines incurred, the developer made an \$18,652 payment to the Wisconsin Department of Natural Resources for a future fish way on the river.[26] Runoff during construction of the Keopuka Lands golf course and resort in Hawaii has carried tons of dirt into the ocean and deposited it on a diverse but fragile reef ecosystem.[27]

One of the more obvious, and potentially dangerous, ways a golf course can impact the environment is through the large-scale application of chemicals including fertilizers, insecticides, pesticides and fungicides. These chemicals can be damaging, sometimes even lethal, to organisms that are exposed to them, either in the water, on the ground or even in the air. It is a fact that most managers and superintendents deploy a large amount of these chemicals in an effort to keep their courses as green and as free from nuisance pests as possible.[28] There are several published studies documenting the runoff of these chemicals into surface water during course operation.[29] Many courses

also use imported or non-native grasses, which require larger doses of chemical treatment than naturally occurring turf grasses.

Reported values for chemical application show a wide range. Chatterjee's study published in 1993 stated that an average of 1500 kg of agrochemicals, some of them known carcinogens, are applied to golf courses each year and that 90 per cent of sprayed chemicals end up in the air.[30] A subsequent study by Chamberlain iterated that a typical 18-hole course uses 22,680 kg of dry and liquid chemicals annually. That averages to approximately 20 kg per treated hectare and is equal to seven times the amount used by large-scale agriculture.[31] At about the same time as these two studies, the USA-based *Journal of Pesticide Reform* found that 750 kg of pesticides are sprayed on a typical course each year, which averaged 11 kg per hectare.[32] Regardless of the source, these numbers were simply too great to be ignored by the public or indeed by the golfing industry, at least in North America. However, the issue of chemicals and golf remains topical, as Lowy reported in 2004: 'Despite nearly a decade of effort by the golf industry to mitigate the sport's environmental impacts, golf courses remain as controversial as ever and the sport's soaring popularity has enlarged, not shrunk, its ecological footprint'.[33]

Golf courses also can have negative impacts on wildlife, as an increasingly large body of research studies continues to demonstrate. Course construction can result in widespread habitat loss and muddied streams that disrupt natural aquatic communities and chemical exposure can be lethal. At the Sapporo Kokusai Country Club in Hiroshima, Japan, course managers spread organic copper compounds on grass to prevent rotting under the annual winter snow cover. When it rained, the chemicals washed into the water system and killed more than 90,000 fish in a nearby aquaculture project.[34] New housing and golf course construction in the late 1990s in southern California has been implicated in the decline of the peninsular bighorn sheep, recently listed as a federally endangered species.[35] A recent study by Winter *et al.* indicated that golf course land management in south central Ontario is associated with significant differences in the abundance of certain benthic algal taxa in headwater streams. When compared with comparatively 'clean' reference streams, the impacted streams had higher nutrient concentrations, more signs of disturbance, higher pH and altered community structures.[36] Course development near Jackson Hole, Wyoming, was opposed unsuccessfully by local groups during 2003. Their prediction was that the project would drive bald eagles from nearby nests. Unfortunately, they were right. One of the abandoned nests had produced more eaglets over the preceding 26 years than any other nest in the greater Yellowstone region, an area roughly the size of West Virginia or the Republic of Ireland.[37] In 1985, Ward Stone and Pete Gradoni of the New York Department of Environmental Conservation compiled data that linked the deaths of 700 Atlantic brent geese to an application of the insecticide diazinon. It was later learned that diazinon was responsible for more than 50 other cases of poisoning that resulted in the deaths of a variety of birds. Following a five-year legal battle, the chemical was banned from golf course usage in 1990.[38]

It has also been shown that people who spend a good deal of time around courses – golfers, caddies, managers, superintendents and nearby residents – may also be susceptible to the effects of hazardous chemicals. Jim Snow, a director of the United States Golf Association (USGA) green section, cautioned golfers in the mid-1990s not to put tees in their mouths.[39] USGA volatilization studies report that organophosphate insecticides that possess high toxicity and volatility could result in exposure situations that cannot be deemed completely safe as judged by the US Environmental Protection Agency (EPA) hazard quotient determination.[40] The University of Iowa College of Medicine conducted a study in which they examined the death certificates of 618 golf course superintendents. They did not establish a causal link between chemical exposure and death, but they did find an unusually high number of deaths from certain cancers, including brain cancer and non-Hodgkin's lymphoma.[41]

Common reactions to chemical exposure include asthma as well as skin rashes, irritations, diseases and other allergic symptoms. In the most extreme case, US Navy Lieutenant George Prior became ill immediately following a round of golf. Prior, who was 30 years old at the time, died 20 days later and an autopsy indicated the death was from exposure to chlorothalonil, a pesticide that is commonly used on golf courses.[42]

Just as harmful as the potential effects of exposure to hazardous chemicals are the social disruption and displacement that can also come with golf course development. Although developers like to tout the benefits associated with a new golf course, the truth is that with courses also come other large developments such as hotels, residential houses, shopping centres, entertainment facilities, power plants, access roads and airports, all of which occupy a large amount of land and come at a high cost to the local communities. There are also debates that consider to which group of people the benefits of course construction actually accrue. Maguire, Jarvie, Mansfield and Bradley, for example, quite rightly argue that the benefits of the global growth of golf as a commercial sports, leisure and tourism activity, though provided at large costs to many, are enjoyed by a small minority.[43] The Sultan Abdul Aziz Shah Golf Club in Salangor, Malaysia went so far in the early 1990s as to offer '[a] lifestyle so leisurely and so gracious that, thankfully, it can be enjoyed by only a select few'.[44] Commonly golf courses are marketed for their exclusivity, highlighting such features as the 'gated-community' or 'signature' status of the course.[45] Another area of environmental impact by golf courses is water consumption. Estimates indicate that an 18-hole course consumes 3,000–5,000 cubic metres per day, which is enough to meet the daily consumption needs for 2,000 families or 15,000 individual Americans.[46] The Worldwatch Institute makes an interesting and startling comparison: 9.5 million m³ is the amount of water used, per day, to irrigate the world's golf courses; it is also the amount of water it would take, per day, to support 4.7 billion people at the United Nations daily minimum requirement, or over four-fifths of the world's estimated 2005 population.[47]

What confounds people even more is that so much of this water use occurs in countries or regions where water is an already scarce resource. In the Greater Palm Springs, California, area in the USA, there are more than 100 courses, each of which

consumes over 3780 m³/day and many of which draw water from the overexploited Colorado River basin.[48] Three municipal golf courses in Tampa in the 1990s used approximately 2120 m³/day, which equals the daily water needs of 5,000 citizens.[49] Some developers have tried to soften the blow of these kinds of numbers by comparing golf course consumption to that of agriculture, but the simple fact is that the service provided by agricultural water use greatly exceeds that by golf courses.

Golf Protest Movements

Local communities are routinely excluded from the decision-making processes regarding course development. These problems are more pronounced in developing countries where there are few laws or regulations requiring full disclosure of information. After losing their battle against developers, local residents often lose their land next. They end up either working as labourers on the course or moving to big cities, as there are no other employment opportunities available. These types of changes can wreak havoc on rural communities while also exacerbating urban problems of slums, pollution and congestion.

These facts have not been lost on all citizens as groups continue to fight against irresponsible development in both the developed and the developing world. A proposed course in Sagaponack, New York, for example, was contested in the late 1990s by a conglomeration of local citizen groups because of fear over the impact of chemicals on their drinking water supply. They had good reason to object as the environmental impact statement for the project included proposed use of the defoliant 2,4-D, an ingredient that comprises 50 per cent of Agent Orange, the herbicide used during the Vietnam War and linked to health problems suffered by veterans.[50] Residents of Carefree, Arizona, protested against a nearby golf tournament because the development company annually pumps twice the amount consumed by all residential wells combined out of the regional groundwater aquifer.[51]

National and international groups opposed to golf course construction began to appear in the early 1990s, and not just in North America. Examples include the Asian Tourism Network (ANTENNA) based in Thailand, the Asia-Pacific People's Environmental Network (APPEN) in Malaysia and the Global Network for Anti-Golf Course Action (GNAGA). These three groups joined together on World No-Golf Day (29 April 1993) to launch the Global Anti-Golf Movement (GAG'M – pronounced 'gag'em'). GAG'M has stated that 'the golf industry aggressively promotes an elitist and exclusive resort lifestyle and notion of leisure' and is aimed at investigating, exposing and challenging the negative environmental consequences of continued development within the golf sport-tourism complex.[52] More recently GAG'M has evolved into the Global Anti-Golf Movement, whose resources can be accessed at www.antigolf.org either in English or Italian, though the website is based in Italy. The Global Anti-Golf Movement is particularly active in Europe (Italy, Spain, Malta and Croatia,) in the USA (via the Sierra Club), but also has supporters in Australia, Asia and Mexico.[53]

Progress in Developed Countries

If all golf courses were built and managed for the sole purpose of revenue generation, there would be a serious problem for the environment. Luckily, that is not the case, as several leading golf nations have started to implement environmentally friendly measures aimed at reducing the impact of course construction and operation and enhancing the sustainability of golf as a sport and leisure activity. Most notably, the United States, Europe and Canada have all made progress along those lines. Some notable examples include:

- In 1989, the USGA began to sponsor significant amounts of research dealing with environmental issues, with priority given to the effects of fertilizers and pesticides on surface and groundwater resources.
- In 1990 the USGA teamed up with Audubon International (the Audubon Society of New York State at that time) to form the Audubon Cooperative Sanctuary Program (ACSP). The ACSP offers certification to environmentally managed courses.
- Since 1991 the USGA's Environmental Research Program has evaluated the effects of golf courses on people, wildlife and the environment.
- The Wildlife Links Program was established in 1995 by the USGA to address biodiversity and functional ecology issues related to golf courses.[54]
- A series of meetings took place in 1995 and 1996 between a committee comprised of 25 people from 16 groups, including the EPA, the USGA, Audubon International, the National Wildlife Federation and the American Society of Golf Course Architects. The result was a set of guidelines for building and operating environmentally friendly golf courses, termed the 'Environmental Principles for Golf Courses in the US'.[55]
- The Audubon Cooperative Sanctuary System of Canada (ACSSC) offers certification to 'green' Canadian golf courses.
- The Royal Canadian Golf Association's (RCGA) green section works in tandem with ACSSC to educate member clubs on the advantages of creating balance between quality playing conditions and a healthy natural environment.
- The RCGA also manages the Canadian Turfgrass Research Foundation, which every year hands \$100,000 over to Canadian post-secondary institutions to conduct research on turfgrass science.[56]
- The European Golf Association ecology unit has created an initiative called 'Committed to Green' that encourages everyone involved in golf to participate in improving the environmental quality of golf courses. Golf clubs can voluntarily participate and receive recognition.[57]

In addition, many golf courses in these countries have implemented new techniques for course construction and operation that purport to minimize environmental impact. These include building courses in places where land use would be improved, such as old landfills, degraded cropland and industrial sites;[58] using recycled asphalt

for cart paths and recycled carpet for bunkers;[59] irrigating with alternative water sources such as treated effluent or unused well water;[60] using organic fertilizer and compost on fairways;[61] creating wildlife habitat by not mowing out-of-play areas;[62] and using constructed wetlands as an additional biofilter for some of the potentially harmful chemicals present on a golf course.[63]

Ongoing Problems in Japan and Developing Asian Countries

The impacts discussed above can occur anywhere a golf course is built. Public education and information exchange, however, have led to a reduction of extreme problems and an acknowledgement of the importance of environmental issues in largely developed areas such as the United States, Canada and Europe. Unfortunately, this level of awareness and concern is not developing as quickly in Japan and countries in south-east Asia. There, especially in south-east Asia, weaker governmental regulations and practically nonexistent enforcement pose substantial problems.[64] Also, governments are not as accountable to citizens and therefore are generally eager to aid developers interested in large-scale construction and even larger profits, some of which may be returned to the government in the form of club memberships in exchange for their cooperation and assistance with the projects. This comes at the expense of local communities and their surrounding ecosystems.

Japan has served as the site for some of the most pronounced growth in the golf industry. There were 23 golf courses in Japan before the Second World War; it was estimated that there would be 3,030 either in operation or soon to open by 2005.[65] As stated above, golf has added over \$14 billion to the national economy and, mimicking the trend seen in the USA, has become an integral part of Japanese corporate culture. The ability to play golf well can aid young employees aiming for advancement within their respective companies.[66] Of course, with this growth have also come many of the problems already outlined.

A study in the 1990s showed that 1360 kg of agricultural chemicals were used each year on Japanese golf courses, an amount eight times greater than that used on rice paddies. Some of these chemicals are known carcinogens while others are known to be mutagenic and neurologically debilitating. It was also estimated that by 1987 more than 5,000 hectares of forest were being destroyed every year for golf course development, a trend that slowed a decade later, though growth continued.[67] The increased nutrient concentrations in runoff stimulate algal growth, which in turn will require treatment plants to use more chlorine to treat the water. Despite the fact that 67 per cent of Japan's total land area is covered by forest, the rate of forest products self-sufficiency has actually decreased by 30 per cent. Japan is now forced to import most of the timber necessary for construction and pulp production in the country. Japan's government has also directly contributed to the problems. Under the administration of Prime Minister Nakasone, legislation known as the Resort Law was passed. The law provided national and local government 'support' for the construction

of golf courses and other sport-leisure-tourism facilities, and got rid of regulations intended to protect land in forested and agricultural areas. This support took shape in the form of tax privileges and permission to convert agricultural land and areas of forest preservation to golf course and other resort use.[68] While golf course development slowed in Japan by the end of the 1990s due to economic recession, high price of memberships and other factors, the golf boom that began in the 1990s in other parts of Asia has continued apace.

The problems associated with golf are particularly acute in south-east Asia for two reasons: the sudden proliferation of golf courses and the fact that course maintenance is more difficult and environmentally hazardous in tropical regions boasting greater numbers of pests, diseases and weeds – all enemies of any course managers. The countries that have been most negatively affected include Malaysia, Thailand, Indonesia, Vietnam, Laos, Burma and Cambodia.[69]

Golf course developers descended on Malaysia in the mid-1990s eager to capitalize on the popularity of the game in Japan. Developers began to explore golf avenues outside Japan for several reasons. The country is small and densely populated, leaving a finite amount of land available for course construction. The cost of playing golf in Japan has skyrocketed and, as a result, many Japanese citizens find it more affordable to travel to other countries to play golf. Opposition to golf courses being built close to mountains and forested areas began to mount in Japan. Finally, course development by Japanese investors is viewed by many to be a positive economic impact in other countries.[70]

Malaysia had only a handful of golf courses in the early 1980s, but this number swelled to over 150 golf courses by 1994 and 189 by the early 2000s, with the usual problems associated with them.[71] The loss of ecologically critical rainforest, an unhealthy reliance on the chemical treatment of courses and social displacement have all surfaced. In order to build the Langkawi Island course and resort, hundreds of rainforest acres were cleared.[72] The harvest of nearby rice fields dropped more than 60 per cent because of the construction-generated sediment that entered streams used to provide water for the fields.[73] The Malaysian government welcomes the investment, showcasing their preference for finance and development over environmental concerns. In fact, the government paid \$7.5 million for a water pipeline connecting a resort on Redang Island with the mainland area of Terengganu, where a cholera epidemic had recently broken out because of an inadequate water supply.[74]

Thailand is another centre of the south-east Asia golf boom. Its first course was built in 1920, but growth was slow until the 1980s. Thailand now boasts over 200 courses.[75] These courses each consume nearly 6,500 m³ of water each day, which is the amount that could be used by 60,000 villagers.[76] Developers buy land bordering proposed construction sites and villagers who live within the newly formed boundaries have few rights and are often forced to sell their land. Shamelessly promoting their infamous sex tourism industry, Thai entrepreneurs had begun to require that caddies were women during the 1990s. The women must attend a training school and are paid for their after-game 'services' by the golfers.[77] The Thai government, unlike others during the 1990s, did intervene on behalf of their citizens in at least one instance when it tried to prevent

golf courses from using water essential to farmers and villagers following a prolonged drought. However, course workers pumped more water from regional aquifers, illegally drained water from reservoirs at night and installed pipes to siphon water from irrigation ditches.[78] More recently, other countries in the Mekong region have joined the boom in south–east Asia because of the relative scarcity of courses, expensive land prices and mounting public opposition elsewhere, and the effective promotion of Mekong tourism. With the globalization of golf course development, one day there will be few untapped markets for golf course development; that day is some time distant, however, and in the meantime, environmental concerns remain a reality for residents near any new development. Quite obviously, the case could be made that the economic benefits of golf courses in developing nations are not worth the potentially devastating environmental costs, particularly when so many of these countries continue to face far more severe problems (lack of clean water, food and farmable land) than a lack of available tee times.

Future Directions and Conclusions

Golf has enjoyed a period of remarkable growth over the past 40 years, but has recently been subject to a number of criticisms questioning the sustainability of the game and the often negative environmental and social impacts it carries. Within the past 15 years, the International Olympic Committee, responding to concerns about the environmental impact of golf course construction and operation, decided not to include golf as a new Olympic sport. Environmental problems can be severe, for humans, wildlife and the ecosystem, and are more of a problem in developing nations without the infrastructure to oppose unchecked and irresponsible construction and operation. The media have played at least some role in the expansion of golf and the extension of some of its associated problems through its glorified coverage of pristine courses and major events. Efforts have been made in some parts of the world to lower the overall impact a golf course has on its surroundings, and have been successful.

As long as developers continue to prey on developing nations as sites for the latest super resort and golf course, however, the negative effects will continue to be felt in at least some parts of the world. Lofty principles alone cannot sway a determined landowner – it is his choice whether and how sensitively a course is built. Economic principles will continue to compete strongly with environmental interests, a battle that is being waged in countless other venues in the newly globalized world. Golf would seem to end up on the wrong side of the argument more often than not – the real challenge will be in attempting to adapt ideas about construction, maintenance and operation in a way that suits those people who are concerned about the environment, particularly in a global setting where environmental issues will likely continue to demand an increasing amount of attention.

Additionally, figures such as Tiger Woods loom large over the golf industry. Many environmentalists fear him, rightly or wrongly, because of the enthusiasm he has generated for the game and the fact that he has stated direct biological links to Asia,

which many see as the last great resource yet to be fully developed and exploited.[79] The media, with their glut of 'Tiger-centric' golf promotion, will play an important role over the next ten to 15 years. Ultimately, though, the final decision on golf will be left up to those millions of people who currently hack away every weekend. At this point, some seem to reside in a state of personal conflict. Keast (2001) reported a survey of 5,000 golfers found that 96 per cent said they enjoyed seeing and hearing wildlife while playing and that 90 per cent wanted golf courses to increase naturalized areas for wildlife, but that 49 per cent said they still prefer putting areas, tees and greens to be flawlessly green.[80] Whether or not golf ends up on the side of economists, environmentalists or somewhere in between the two is still up in the air. At the very least, more sustainable development techniques should be implemented and more people need to be educated about the environmental threats posed by aggressive and thoughtless development so that an informed decision can be made regarding the future of the golf industry. It is also imperative that sociologists of sport take an active interest in the issues that surround golf and the environment, both in the developed and the developing world, so that a critical discourse is maintained and that developers of new golf courses and resorts are held accountable for their decisions that effect not only the users of their facilities, but people, wildlife and vegetation located on or near such developments.

Notes

- [1] Keast, 'Going for the Green', 37.
- [2] Wray, Q., 'Jozi Whiz Kid Has Golfing Success Right Down to a Tee', *Business Report*, 28 Sept. 2003, citing sport marketing reports on golf participation, available online at <http://www.busrep.co.za/index.php?fArticleId=244889>, accessed 16 Dec. 2005.
- [3] National Golf Foundation, 'Golf Participation in the US'.
- [4] Lowy, J., 'Thirsty Golf Courses Drive Environmental Protests', Scripps-Howard News Service, 22 April 2004, available online at <http://www.knoxstudio.com/shns/story.cfm?pk=GOLFC-OURSE-04-22-04&cat=AN>, accessed 28 Oct. 2004.
- [5] *Golf and the Environment – A General Perspective*, available online at <http://www.golfecology.com/publics/strategy/black3.htm>, accessed 5 Nov. 2004.
- [6] 'China the Largest Growth Market for Equipment', *Golf Today*, n.d. available online at <http://www.golftoday.co.uk/news/yeartodate/news04/china.html>, accessed 16 Dec. 2005.
- [7] As reported by the *Guinness Book of World Records*: see R. Scott Macintosh, 'In China, A Golf Community on a Supergrand Scale', *International Herald Tribune*, 30 Sept. 2005. Article reproduced by Greg Norman Golf Course Design, available online at <http://www.shark.com/gngcd/gngcd/093005a.php>, accessed 28 Dec. 2005.
- [8] National Golf Foundation, n.d., available online at <http://www.ngf.org/cgi/home.asp>, accessed 9 Nov. 2004.
- [9] *Golf and the Environment*.
- [10] Platt, 'Toxic Green'; Hildebrandt, T., 'Environmentalists Cry "Fore!" in China', *Christian Science Monitor*, 16 July 2003, 11, accessed 5 Nov. 2004 from GALILEO (ProQuest database).
- [11] Good examples of concerns raised by activists and scientists since 1990 are Keast, 'Going for the Green'; Platt, 'Toxic Green'; Chatterjee, 'Clubbing Southeast Asia'.

- [12] Greg Norman Golf Course Design, 'Environmental Philosophy', available online at http://www.shark.com/gngcd/gngcd/environmental_philosophy.php, accessed 28 Dec.2005.
- [13] The few references include a section in the textbook, Maguire *et al.*, *Sport Worlds*; Todd Crosset's study of women in golf, *Outsiders in the Clubhouse*; and a couple of articles and book chapters by Brian Stoddart: 'Golf International' and 'Golf in the Modern Age'. Recently several articles have begun to appear on golf in the sociology of sport, but these are almost exclusively focused on issues of gender; for examples see Nylund, 'Taking a Slice at Sexism; McGinnis *et al.*, 'I Just Want to Play.
- [14] Keast, 'Going for the Green', 37.
- [15] Stuller, 'Golf Gets Back to Nature'.
- [16] Nyad, 'Commentary: Ecological Impacts Golf Courses Have on the Environment'. *Morning Edition*, National Public Radio (US), 17 July 2000. Transcript retrieved 5 Nov. 2004 from GALILEO, ProQuest database.
- [17] Keast, 'Going for the Green', 37; Stuller, 'Golf Gets Back to Nature'.
- [18] Keast, 'Going for the Green', 37.
- [19] Keast, 'Going for the Green'; Stuller, 'Golf Gets Back to Nature'.
- [20] Ling, 'Golf Gulf Divides Rich and Poor'.
- [21] For example, see Winter *et al.*, 'Impacts of Golf Course Construction'.
- [22] Chatterjee, 'Clubbing Southeast Asia'.
- [23] Esposito, 'Fairways in the Rough'.
- [24] Likens and Bormann, 'An Experimental Approach'.
- [25] See Winter *et al.*, 'Impacts of Golf Course Construction'.
- [26] Esposito, 'Fairways in the Rough'.
- [27] Tang, 'Hawaii Golf Courses'.
- [28] Winter *et al.*, 'Impacts of Golf Course Construction'.
- [29] Kunimatsu *et al.*, 'Loading Rates of Nutrients'; Mallin and Wheeler, 'Nutrient and Fecal Coliform Discharge'; Sudo and Kunimatsu, 'Characteristics of Pesticide Runoff'; 'Common Arsenical Pesticide Under Scrutiny', *Science News*, 9 Feb. 2005, available online at http://pubs.acs.org/subscribe/journals/esthag-w/2005/feb/science/jp_arsenical.html, accessed 28 Dec. 2005.
- [30] Chatterjee, 'Clubbing Southeast Asia'.
- [31] Chamberlain, 'Golf Endangers Hawaiian Ecology and Culture'.
- [32] Cited by Platt, 'Toxic Green'.
- [33] Lowy, 'Thirsty Golf Courses Drive Environmental Protests', 1–2.
- [34] Chatterjee, 'Clubbing Southeast Asia'.
- [35] Esposito, 'Fairways in the Rough'.
- [36] Winter *et al.*, 'Impacts of Golf Course Construction'.
- [37] Lowy, 'Thirsty Golf Courses Drive Environmental Protests', 1.
- [38] Platt, 'Toxic Green'.
- [39] 'Teeing Off or Keeling Over?'
- [40] Kenna and Snow, 'Turfgrass and Environmental Research Program'.
- [41] Kross *et al.*, 'Proportionate Mortality Study'.
- [42] Chatterjee, 'Clubbing Southeast Asia'; Platt, 'Toxic Green'.
- [43] Maguire *et al.*, *Sport Worlds*, 92–5.
- [44] Quoted in Ling, 'Golf Gulf Divides Rich and Poor'.
- [45] For an example of this see Pierce, B., 'Tennessee National to Open Next Summer', *Daily Times*, 2 Jan. 2006, cited on the Greg Norman Golf Course Design Website, available online at <http://www.shark.com/gngcd/gngcd/010206.php>, accessed 6 Jan. 2006. Tennessee National is a \$500 million development.
- [46] Hildebrandt, 'Environmentalists Cry "Fore" in China'.

- [47] Information from Worldwatch Institute, available online at <http://www.worldwatch.org>, accessed 9 Nov. 2004
- [48] Nyad, 'Commentary: Ecological Impacts'.
- [49] Platt, 'Toxic Green'.
- [50] Kiggen-Miller, E., 'In Debate Over Earth and Water, There's Fire in the Air', *New York Times*, 20 Sept. 1998.
- [51] 'Arizona Golf Courses Teeing Off Residents'.
- [52] Chatterjee, 'Clubbing Southeast Asia'.
- [53] www.antigolf.org, accessed 6 Jan. 2006.
- [54] Kenna and Snow, 'Turfgrass and Environmental Research Program'.
- [55] Shapard, 'Environment at the Fore Front'.
- [56] Keast, 'Going for the Green'.
- [57] 'Committed to Green', available online at <http://www.golfecology.com>, accessed 10 Nov. 2004.
- [58] Esposito, 'Fairways in the Rough'.
- [59] Ward, 'From Tee to Greenspace'.
- [60] McCartney, 'Organics Recycling', 27–8; Tang, 'Hawaii Golf Courses'; Ward, 'From Tee to Greenspace'.
- [61] McCartney, 'Organics Recycling'; Tang, 'Hawaii Golf Courses'.
- [62] Malicoat, 'More Golf Courses Strive to Go Green'.
- [63] 'Golf Course "Hazard" Filters Runoff Pollution'.
- [64] Hildebrandt, 'Environmentalists Cry "Fore!" in China'; 'Green Menace, The Untold Story of Golf – From Gambling to Deforestation'. Aired on *The Cutting Edge*, SBS, Australia, 5 July 1994. 'Green Menace' explored the golf boom and its impact on the social and natural environment in Thailand.
- [65] Worldwatch Institute.
- [66] Takeda, 'Golf's Social and Environmental Impact on Japan'.
- [67] Platt, 'Toxic Green'; Mettam, G., 'Flexible Foreigners Make Golf in Japan More Accessible – Even for Your Pet!', *Mainichi Daily News*, 15 Dec. 2005, available online at <http://mdn.mainichi-msn.co.jp/features/news/20051215p2g00m0fe016000c.html>, accessed 9 Jan. 2006.
- [68] Takeda, 'Golf's Social and Environmental Impact on Japan'.
- [69] Roberts, 'Golf Tourism in Japan'; Walsh, 'Golf, Tourism and Environment'.
- [70] Roberts, 'Golf Tourism in Japan'.
- [71] Platt, 'Toxic Green'; Malkeet Kaur, 'Eradicating the Alligators from the Golf Course', Asian Professional Golfers Association 2001–6, available online at <http://www.asianpga.com/article.php?sid = 166>, accessed 8 Jan. 2006 (lists total Malaysian golf courses at 189).
- [72] Chatterjee, 'Clubbing Southeast Asia'.
- [73] Platt, 'Toxic Green'.
- [74] Hildebrandt, 'Environmentalists Cry "Fore!" in China'.
- [75] 'Golf in Thailand' (2004), available online at <http://www.mekong-travel.com/golf.htm>, accessed 8 Jan. 2006. Also see Pleumarom, 'Golf Courses in the Mekong Sub-region: A Green Menace'.
- [76] Hildebrandt, 'Environmentalists Cry "Fore!" in China'.
- [77] Platt, 'Toxic Green'; Walsh, 'Golf, Tourism and Environment'.
- [78] Platt, 'Toxic Green'.
- [79] Hildebrandt, 'Environmentalists Cry "Fore!" in China'; Lowy, 'Thirsty Golf Courses Drive Environmental Protests'; Nyad, 'Commentary: Ecological Impacts'.
- [80] Keast, 'Going for the Green'.

References

- 'Arizona Golf Courses Teeing Off Residents'. *Environment* 33, no. 4 (May 1991), accessed 9 Nov. 2004 from GALILEO (Academic Search Premier database).
- Chamberlain, S., 'Golf Endangers Hawaiian Ecology and Culture'. *Earth Island Journal*, Summer 1995, available online at <http://www.earthisland.org/journal/golf.html>, accessed 5 Nov. 2004.
- Chatterjee, P., 'Clubbing Southeast Asia: The Impacts of Golf Course Development'. *Multinational Monitor* 14 (November 1993), available online at http://www.multinationalmonitor.org/hyper/issues/1993/11/mon1193_13.html, accessed 5 Nov. 2004.
- 'Committed to Green'. (n.d.), available online at <http://www.golfecology.com>, accessed 5 Nov. 2004.
- Crosset, Ted. *Outsiders in the Clubhouse: The World of Women's Professional Golf*. Albany, NY: SUNY Press, 1995.
- Esposito, K. "Fairways in the Rough." *Wisconsin Natural Resources Magazine*, August 1998, available online at <http://www.wnrmag.com/stories/1998/aug98/golf.htm>, accessed 5 Nov. 2004.
- 'Golf and the Environment – A General Perspective'. (n.d.) Accessed November 5, 2004, available online at <http://www.golfecology.com/publics/strategy/black3.htm>, accessed 5 Nov. 2004.
- 'Golf Course "Hazard" Filters Runoff Pollution'. *USA Today Magazine* 131, no. 2697 (June 2003), accessed 9 Nov. 2004 from GALILEO (Academic Search Premier database).
- Keast, M. "Going for the Green." *Canadian Wildlife*. Spring 2001.
- Kenna, M. P., J. T. Snow 'Turfgrass and Environmental Research Program of the United States Golf Association – A Summary of Key Findings', available online at <http://www.golfecology.com>, accessed 5 Nov. 2004.
- Kross, B. C., L. F. Burmeister, L. K. Oglivie, L. J. Fuortes, and C. M. Fu. "Proportionate Mortality Study of Golf Course Superintendents." *American Journal of Industrial Medicine* 29, no. 5 (May 1996): 501–6.
- Kunimatsu, T., M. Sudo, and T. Kawachi. "Loading Rates of Nutrients Discharging from a Golf Course and a Neighboring Forested Basin." *Water Science and Technology* 39 (1999).
- Likens, G.E. and F.H. Bormann. "An Experimental Approach in a New England Landscape." In *Coupling of Land and Water Systems*, edited by A.D. Hasler. New York: Springer Verlag, 1975: 7–29.
- Ling, C.Y. "Golf Gulf Divides Rich and Poor." *Earth Island Journal* 7, no. 4 (Fall 1992), accessed 9 Nov. 2004 from GALILEO (Academic Search Premier database).
- Maguire, J., G. Jarvie, L. Mansfield, and J. Bradley. *Sport Worlds: a Sociological Perspective*. Champaign, Illinois: Human Kinetics, 2002.
- Malicoat, G. "More Golf Courses Strive to Go Green." *Grand Rapids Business Journal* 18, (13 Nov. 2000), accessed 9 Nov. 2004 from GALILEO (MasterFILE Premium database).
- Mallin, M. and T. Wheeler. "Nutrient and Fecal Coliform Discharge from Coastal North Carolina Golf Courses." *Journal of Environmental Quality* 29, (2000).
- McCartney, D. "Organics Recycling at Golf Course in Canadian National Park." *Biocycle* 42, no. 8 (August 2001).
- McGinnis, Lee, Julia McQuillan, and Constance L. Chapple. "I Just Want to Play: Women, Sexism, and Persistence in Golf." *Journal of Sport and Social Issues* 29 (August 2005): 313–37.
- National Golf Foundation. n.d. available online at <http://www.ngf.org/cgi/home.asp>, accessed 9 Nov. 2004.
- . 'Golf Participation in the US – 2004 Edition', cited in *Grounds Maintenance*, 'Number of Golfers is Growing', available online at <http://grounds-mag.com/news/number-golfers-growing>, accessed 6 Dec. 2005.
- Nylund, David. "Taking a Slice at Sexism: The Controversy Over Exclusionary Membership Practices at the Augusta National Golf Club." *Journal of Sport and Social Issues* 27 (May 2003): 195–202.
- Platt, Anne E. "Toxic Green: The Trouble with Golf." *World Watch*. 7 May–June 1994.

- Pleumarom, A. "Golf Courses in the Mekong Sub-region: A Green Menace." available online at <http://www.cenotes.com/save/ingles/mekong.html>, accessed 2 Sept. 2004.
- Roberts, A. "Golf Tourism in Japan and Environmental Aspects." *TED Case Studies* 5, no. 1 (2004/January 1996), available online at <http://www.american.edu/TED/japgolf.htm>, accessed 9 Nov. 2004.
- S., G. "No Golf Day." *Earth Island Journal* 8, no. 2 (Spring 1993), accessed 9 Nov. 2004 from GALILEO (Academic Search Premier database).
- Shapard, R. "Environment at the Fore Front: Keys for Greener Municipal Golf Courses." *American City and County*. April 1997, accessed 9 Nov. 2004 from GALILEO (Academic Search Premier database).
- Stuller, J. "Golf Gets Back to Nature, Inviting Everyone to Play." *Smithsonian* 28, no. 1 (April 1997), accessed 9 Nov. 2004 from GALILEO (Academic Search Premier database).
- Stoddart, Brian. "Golf International." In *Sport in the Global Village*, edited by R. Wilcox. Morgantown, WV: Fitness Information Technology, 1994.
- . "Golf in the Modern Age: Joe Kirkwood in Asia." *Sporting Traditions* 15, no. 2 (May 1999): 3–17.
- Sudo, M. and T. Kunitatsu. "Characteristics of Pesticide Runoff from Golf Links." *Water Science and Technology* 25 (1992).
- Takeda, A. "Golf's Social and Environmental Impact on Japan." *TED Case Studies* 5, no. 2 (June 1996), available online at <http://www.american.edu/TED/jpgolf.htm>, accessed 9 Nov. 2004.
- Tang, H. "Hawaii Golf Courses Strive to Stay Environmentally "Green"?" *Pacific Business News* 38, no. 37 (2000), accessed 5 Nov. 2004 from GALILEO (ProQuest database).
- "Teeing Off or Keeling Over?" *Environment* 36, no. 6 (July/August 1994), accessed 9 Nov. 2004 from GALILEO (Academic Search Premier database).
- Walsh, L. "Golf, Tourism and Environment and Trade Aspects in Japan." *TED Case Studies* 5, no. 1 (January 1996), available online at <http://www.american.edu/TED/asiagolf.htm>, accessed 9 Nov. 2004.
- Ward, J. "From Tee to Greenspace." *American City and County*, October 2000, available online at http://americancityandcounty.com/mag/government_tee_greenpace/, accessed 6 Jan. 2006.
- Winter, J.G., P.J. Dillon, C. Paterson, R.A. Reid, and K.M. Somers. "Impacts of Golf Course Construction and Operation on Headwater Streams: Bioassessment Using Benthic Algae." *Canadian Journal of Botany* 81, no. 8 (2003):, accessed 5 Nov. 2004 from GALILEO (ProQuest database).