***Climate Law in Developing Countries post-2012: North and South Perspectives*, IUCN Academy of Environmental Law, Faculty of Law, University of Ottawa, Canada (26-28 September 2008)**

"How Can Environmental Law Be Used to Decrease the Effects of Global Climate Change on Cultural Heritage Sites?"

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Synopsis:

Climate change poses a severe threat to many cultural heritage sites. Threats include floods, increasing thunderstorms and rainfall, desertification, deterioration of permafrost and the decay of cultural landscapes. Protecting cultural heritage sites proves to be very difficult because they are as diverse as the threats from climate change. This paper argues that laws from different areas of environmental law such as heritage conservation law, pollution law, land use law, construction law, water law, environmental impact assessment law and planning law must be used in an integrated way to form a comprehensive system of legal instruments and enforcement mechanisms in order to minimise the effects of global climate change on heritage properties.

1 INTRODUCTION

Global climate change is likely to become one of the most serious challenges that humankind will face in this century and beyond. It is defined by Article 1 of the United Nations Framework Convention on Climate Change (UNFCCC) as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods". Though serious efforts have been undertaken to research this process in recent years, we are still far from understanding all of its mechanisms. However, there seems to be no reasonable doubt that the effects of global climate change on our planet will increase over the next years and centuries. The expected and already observed impacts of climate change include an increase "in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level".[1] This will also have as consequences an increase of extreme weather events, a change of precipitation in many regions, an increase of ground instability in permafrost regions, changes in the ecosystems and an increase of glacial lakes and avalanches.[2]

Those meteorological changes will not only severely affect Earth's biodiversity and landscapes, but they will also have an enormous impact on humankind. While the ecological impacts of global climate change on humankind have become very prominent subjects of research in recent times, the possible impacts on its cultural heritage have hardly been discussed yet. However, it is urgent to do so as cultural heritage is a non-renewable resource. Once it is gone, it cannot be brought back again. On that score, it does not differ from natural heritage. Of course the shape of some cultural heritage sites can be recreated if they are well recorded, but even if the same craftsmanship, materials and location is used to rebuild the site in detail, its integrity might be lost forever. However, the World Heritage Committee recently expressed its awareness of those threats[3] and carried out substantial case studies on the

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1 Core Writing Team, Rajendra K. Pachauri and Andy Reisinger (eds.), "Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change" (IPCC, 2007) at 30.

2 Ibid. et seqq..

3 See Decision 29COM 7B.a. from the 29th Session of the World Heritage Committee (Durban, 2005).

dangers that climate change poses not only to natural, but also to cultural World Heritage Sites.[4]

The importance of the preservation of cultural and natural sites can hardly be stressed enough. Culture plays a significant role in the survival of all individual parts of populations as distinguishable elements of humankind. It represents a manifestation of diversity among all culturally distinct groups, such as States, ethnic communities or religious groups.[5] The preservation of this diversity is crucial to the survival of humankind as it does not only divide, but it also provides identity to all individual groups.

Heritage sites play a major role in reflecting cultural heritage and they assist in ensuring that people continue to be aware of their cultural identities, pasts and traditions. They are often also reminders of the human need to adapt to the environment in order to survive in various parts of Earth. This need for adaptation often shows in the appearance of early peoples, as well as in the way they sheltered themselves. Early migration resulted in the shaping of new ethnic communities and their change of appearance in order to adapt to different climates and environments. This had an impact on their skins, forms of behaviour and physiologies, which allowed them to adapt to cooler or hotter temperatures, different levels of ultraviolet radiation and even different surfaces. The impacts of the environment on local populations also reflected in their designs of clothes and buildings, which could be regarded as their second and third skins.[6] For these reasons among others, heritage sites must be regarded as an important element of the human environment. They are a significant part of the memory of humankind and help understanding its diversity.

It is clear from the foregoing how important it is to minimise the effects of global climate change on cultural heritage sites in order to protect them from additional decay or destruction caused by such environmental influences. The key component of this task is to understand the different ways climate change threatens all kinds of cultural heritage sites. Furthermore, it is crucial to learn how the law can assist in this context, what role the existing international legal framework and national environmental law can play in addressing the

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4 UNESCO World Heritage Centre, *Case Studies on Climate Change and World Heritage* (UNESCO World Heritage Centre, Paris) (2007), available at <http://whc.unesco.org/documents/publi_climatechange.pdf>.

5 Francesco Francioni, "Beyond State Sovereignty: The Protection of Cultural Heritage as a Shared Interest of Humanity" (2004) 25 *Michigan Journal of International Law* 1209 at 1209, 1210.

6 Susan Roaf, David Crichton and Fergus Nicol, *Adapting Buildings and Cities for Climate Change: A 21st Century Survival Guide* (Architectural Press, Oxford) (2005) at 34; for case studies see chapter 2.

expected effects of climate change and how the relevant law can be made more effective to minimise the threats mentioned above.

2 THREATS TO CULTURAL HERITAGE SITES FROM CLIMATE CHANGE

Cultural heritage sites can be found in many different sizes and shapes. They may include architectural structures, such as historic cities, memorial sites, temples and palaces or sites of historical importance, ancient burial sites and cultural landscapes. However, in order to be regarded as heritage, such sites need to be considered as valuable and as worthy of being preserved for future generations.[7] Of course it is often arguable whether a site matches those criteria, while some related decisions are subjective and even politically motivated.[8] However, there are many regulations in place on local, national and international level that lay down how to make such decisions.[9]

However, not only the variety of cultural heritage sites is immense. The threats that global climate change poses to many of those sites are also numerous and very diverse. They include the increase of windstorms, sea level rise, the increase of humidity or dry climate, the deterioration of permafrost, increasing desertification and other soil degradation. Those environmental influences can affect built structures, for example either by sandstorms or floods, or buried relics by processes of faster decay. It is not surprising that cultural heritage sites are threatened, especially in areas where humankind has had to struggle the most for its survival. As will be illustrated below, places where the climate or other environmental factors were particularly hostile to human settlements or explorers often react the most dramatically to climate change.

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7 Janet Blake, "On Defining the Cultural Heritage" (2000) 49 *International and Comparative Law Quarterly* 61 at 68.

8 Stefan Gruber, "Protecting China's Cultural Heritage Sites in Times of Rapid Change: Current Developments, Practice and Law" (2007) 10 *Asia Pacific Journal of Environmental Law* 253 at 256.

9 For example see the definition of „universal value" in *Operational Guidelines for the Implementation of the World Heritage Convention*, para 49; see also Ben Boer, "Article 3: Identification and Delineation of the World Heritage Properties" in Francesco Francioni and Federico Lenzerini (eds), *The 1972 World Heritage Convention: A Commentary* (Oxford University Press, Oxford) (2008) at 85 et seqq..

Effects of climate change on cultural heritage sites are not a new phenomenon, but can be traced to the beginning of records of human civilization. The first small human settlements and cities were founded in the early stages of the Holocene interglacial, which began approximately 8,000 BC. However, this period was followed by a significant and long-lasting rise of the sea level, which led to a flooding of many coastal settlements. Their remains can be found nowadays often far off the coast in the Mediterranean Sea and the Indian Ocean.[10] There also has been a significant impact on cultural landscapes as viniculture and agriculture were often affected by climate change. Before the Little Ice Age (ca. 1550-1850) there was a warm period, which even allowed winegrowing in England. The following cooling down of the average temperature pushed the Northern border of winegrowing several hundred kilometres to the South.[11] Such changes always cause an impact on the way of living of the local population and therefore on how they shape the landscape and adapt their buildings to those changed circumstances.

2.1 Deterioration of permafrost

One of the most visible consequences of climate change is the deterioration of permafrost in many parts of Earth. This does not only cause a constant retreat of glaciers and the melting of the eternal ice at the polar caps, but it also means a serious threat to many cultural heritage sites.

One of the case studies examined by the World Heritage Committee inter alia focused on a whalers' settlement on Herschel Island in Yukon,[12] which is currently on the Canadian World Heritage Tentative List as part of a larger area to be nominated for inscription in the near future. Due to the decrease of sea ice Herschel Island significantly suffered from its increased exposure to storms, which drastically hastened coastal erosion. The waves now constantly eat away land, while the defrosted and wet ground has started to slump. The authorities have been forced to move the old buildings inland and salvage heritage items. Those buildings might have to be abandoned completely if land erosion continues as the sea

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[10] Jonathan Cowie, *Climate Change: Biological and Human Aspects* (Cambridge University Press, Cambridge) (2007) at 193.

[11] Ibid. at 194.

[12] For further information, see <http://www.yukonheritage.com/Sign/northern/herschel/herschel.html>; UNESCO World Heritage Centre, note 4 at 58, 59.

washes more of the destabilised ground away. Especially the whalers' graveyard has suffered, as several caskets and markers were destroyed by landslides. Much evidence of early human settlement in that region has already been lost.

Perhaps the influence of climate change in such regions can be observed best in Greenland.[13] Roughly 1,000–1,500 AD Greenland used to host large Viking settlements, which sustained themselves by farming and livestock breeding. However, with the onset of the Little Ice Age, farming became increasingly more difficult until the whole population was wiped out by famine or abandoned their homes. Many remains of Viking settlements give evidence of those times. Especially the graves of those times not only provide invaluable archaeological insights, but they are also reminiscent of past warmer periods when some of Greenland was in fact still green, which it is likely to become again. Though those graves were protected by permafrost during the last centuries, they would have been impossible to dig in frozen soil. This proves that the ground must have been soft when the graves were burrowed. However, the protecting permafrost vanishes due to the rising temperatures, which makes the ground soggy and causes the contents of the graves to rot.

Ironically, sometimes the melting of ice sheets reveals archaeological treasures which otherwise may never have been discovered. On the other hand, those items are perfectly protected by the ice and are exposed to deterioration once the protecting cover is gone. The only option in such cases is an immediate salvage operation to save the items before they decompose.[14]

Cultural heritage sites in arctic regions are often time capsules. The constant cold temperatures below zero stop the deterioration process nearly completely and preserve items and materials, which would otherwise have disintegrated a long time ago. The temperatures keep the items and sites dry and protect them from decay. Some of the sites, which have been abandoned at least a century ago, still look like they have just been left. In the case of the survey bases and huts of the early Antarctic explorers they give us invaluable and clear insights into the circumstances of their achievements, which were often marked by hardship and privation. They are a strong reminder of the conditions under which the world has been

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[13] For an in-depth examination of the accelerated melting of glaciers in Greenland, see: Eric Rignot and Pannir Kanagaratnam, "Changes in the Velocity Structure of the Greenland Ice Sheet" (2006) 311 *Science* 986.

[14] Kevin Krajick, "Melting Glaciers Release Ancient Relics" (2002) 296 *Science* 454.

discovered and explored that we know today. Several of those sites are protected and declared as historic sites under the Antarctic treaty.[15]

A very fine example for Antarctic heritage sites are the huts of Douglas Mawson at Cape Denison in the Antarctic Commonwealth Bay, which were occupied between 1911 and 1914. This site is one of the very few remaining sites from the "Heroic Era of Antarctic exploration" and is also a monument to the early Australian Antarctic expeditions. However, the most serious enemy to such sites is increasing temperatures. If the temperatures rise above freezing point, the sites are exposed to humidity, which initiates a much faster process of decay. Especially wooden buildings absorb water, which expands once it freezes again. This causes severe damage of the wood. Furthermore, warmer temperatures increase the chance of fungal attacks and let bacteria and parasites flourish, which contribute further to the breakdown of wooden structures. Research at Mawson's huts showed that once a certain level of humidity inside the huts is reached, there is enough moisture to allow bio-deterioration even in very cold temperatures.[16] Another threat to such sites becomes obvious at Scott's hut at Cape Evans in the Antarctica. It is located only fifty metres from the shore and two metres above high water level. However, it is also located only 1 kilometre away from the Barne Glacier and its fifty metres high terminal wall of ice. There is little doubt that the hut would be destroyed by a wave when a part of that wall collapses, which becomes more and more likely with rising temperatures.[17]

2.2 Desertification

Another serious threat to many cultural heritage sites is the increasing desertification in many regions, which is significantly accelerated by climate change. Article 1(a) of the United Nations Convention to Combat Desertification (UNCCD) defines desertification as "land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors,

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[15] For the text of the Antarctic Treaty, the Environmental Protocol and its Annexes, see <http://www.ats.aq/e/ats.htm>.

[16] See a report from Campbell Scientific Australia from 2002 at <ftp://ftp.campbellsci.com/pub/outgoing/apglanc/24-mawsons.pdf>.

[17] A case study on Scott's hut can be found in "ICOMOS World Report 2006/07 on Monuments and Sites in Danger" (ICOMOS, 2008) at 206 et seqq., available at <http://www.international.icomos.org/risk/world_report/2006-2007/pdf/H@R_2006-2007_web.pdf>.

including climatic variations and human activities".[18] It is often caused by the removal of a protective cover from fertile soil in dry zones, which is washed or blown away as a result. The consequences include the expansion of sand dunes, further erosion and sometimes the total loss of vegetation in the area.

Climate change contributes to the migration of sand dunes in several ways. The sand dunes in the peripheral areas of deserts are often stabilised by vegetation, where roots prevent them from moving. If higher temperatures along with less rainfall further contribute to the droughts in such areas, the scarce vegetation declines and the sand dunes begin to migrate. Once the sand dunes become mobile, all vegetation in their vicinity is at high risk and a chain reaction starts, which can hardly be stopped. The increasing numbers of windstorms, which are fuelled by climate change, make the situation even worse as sand is blown longer distances and more frequently.

Desertification can severely threaten cultural heritage sites. Migrating sand dunes already bury many cultural treasures. Once an area is affected by desertification, the desert is there to stay and the sand dunes can be expected to constantly grow higher. One of the case studies presented by the World Heritage Centre report deals with sites in Timbuktu and especially the Sankoré mosque.[19] Because of the constant sand encroachment, the walls have been continuously raised to prevent the mosque from being buried under the sand. Just in the last fifty years they were raised by one metre. This also led to an inscription of the site on the World Heritage in Danger List for fifteen years.[20] The site was removed from that list after the strategy of removing the sand from the vicinity of the mosques, creating buffer zones and improving the drainage system, proved to be successful.[21]

Other heritage sites are more difficult to protect, either because of their remote location or due to their sheer size. Probably the most prominent example is the Great Wall of China, with a total length of 6,300 kilometres, stretching across nine provinces. Nowadays only one third of it is mostly intact, one third is severely damaged and one third has vanished completely. Long sections of the Great Wall stretch through vast desert areas, which begins

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[18] The text of the United Nations Convention to Combat Desertification is available at <http://www.unccd.int/convention/text/convention.php>.

[19] UNESCO World Heritage Centre, note 4 at 74, 75.

[20] Report of the 14th session of the World Heritage Committee in Banff 1990 <http://whc.unesco.org/archive/repcom90.htm#timbuktu>.

[21] See Decision 29COM 7A.14 from the 29th Session of the World Heritage Committee (Durban, 2005).

near its most Western point in Jiayuguan. Those sections are mainly built of mud, as building materials were scarce in those areas. Even bricks and stones for the watchtowers had to be brought in from other regions. Sandstorms place those sections under constant stress and their mud structures are being worn out further and further. The grinding effects of the sandstorms are widely visible and have already turned wide sections of the wall into dust. This example illustrates another serious threat from desertification. Many heritage structures are very sensitive to sandstorms and are worn out over the years. Existent paint is sanded off and the surface is removed layer after layer.

However, desertification is not only a problem in Africa or Asia. Southern Europe is also increasingly threatened. This especially applies to Spain, a very heritage-rich country, which currently has forty of its heritage sites inscribed on the World Heritage List.[22] The effects of climate change combined with intense development are especially evident in Southern Spain.

One of the regions affected the most is the Spanish province of Murcia. Too much area was assigned for resort development including golf courses and swimming pools. In addition, the local farmers relied on crops unsuitable for a drier climate. This put constant stress on the ground water level and the soil over a period of years, which is why the hotter and dryer climate now hits the region even worse. For too long land use was unsustainable and used far more water than the region could provide. The shortage of water even led to the drilling of numerous illegal wells, which depleted the ground water even further. The officials already speak about an "Africanization" of Spain's climate and fear that one third of the country is at risk of turning into desert because of climate change combined with poor land use.[23]

2.3 Ocean rise and floods

Not only droughts, but also floods pose a significant threat to cultural heritage sites. Sometimes this occurs even in the same area when droughts alternate with heavy rainfall. Besides being threatened by the effects of desertification, the mud structures in Timbuktu mentioned in the case studies by the World Heritage Centre[24] have suffered severely from

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22 See <http://whc.unesco.org/en/statesparties/es>.

23 Elisabeth Rosenthal, "Desert Is Claiming Southeast Spain", *International Herald Tribune* 2 June 2008.

24 UNESCO World Heritage Centre, note 4 at 74, 75.

heavy rainfall in recent years. Especially earthen structures are most vulnerable when they are exposed to increasing precipitation. Because they become unstable when too much water wears out their foundations and walls, many earthen structures in Timbuktu have collapsed because of the torrential rain.

However, the main danger relating to floods is posed by the constant rise of the oceans. An estimated 85 % of Earth's freshwater is frozen at the polar caps. An inevitable result of their melting due to the rising temperature is a constant release of freshwater, which causes the sea level to rise steadily. As 70% of the world population live in coastal areas, the larger part of it will be affected directly by that development. Besides coastal erosion and increased floods, this can also mean the end of several settlements. A number of islands in the Southern Pacific have already had to be abandoned after the rising ocean seeped into the ground water.[25]

The threat at river deltas is often even bigger. Earlier snowmelt can lead to river floods, while the rise of the ocean level slows down the outflow of the water into the ocean.[26] This can easily result in dramatic floods in river deltas, which are usually heavily inhabited. The rise of the sea level also threatens many World Heritage Sites, such as those along the River Thames in London. UNESCO sees the most serious flood threat to London being constituted by the conjunction of high tides and storm surges in the North Sea, pushing water into the Thames Estuary.[27] An overflowing of the Thames embankments would inevitably lead to a flooding of at least the National Maritime Museum, the Tower of London and the Palace of Westminster. Much more grave is the situation for Venice as the city is constantly sinking. This process was hastened by the creation of numerous artificial wells in the periphery of the lagoon for industrial projects. By the time such actions were stopped, permanent harm had already been caused. Now the rise of the sea level poses an additional threat to Venice, which basically means that the city must get used to periodical flooding despite the installation of a system of barrages.

The increasing number of heavy storms further exacerbates the threat from floods. There are strong scientific indications that not only the number of storms is constantly

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[25] See a recent article on the Carteret Islanders in the seasonal magazine of the Australian Museum: Taloi Havini, "An Uncertain Future" (2008) September to November *Explore* 14.

[26] Richard S. J. Tol, Nicolien van der Grijp and Alexander A. Olsthorrn, "Adapting to Climate: A Case Study on Riverine Flood Risks in the Netherlands" (2003) 23 *Risk Analysis* 575 at 577.

[27] UNESCO World Heritage Centre, note 4 at 67.

increasing, but also that climate change is contributing directly to that development.[28] This especially applies to hurricanes, which pose a serious threat to many coastal settlements. How disastrous the impact of hurricanes can be was tragically shown in 2005 when Hurricane Katrina destroyed large parts of New Orleans.[29] Most parts of the historic New Orleans were lost to the floods.

2.4 Damage to rural cultural landscapes

A final issue to be mentioned is the effect of climate change on cultural landscapes. "Cultural landscapes are cultural properties and represent the combined works of nature and of man (...) They are illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal."[30] The underlying concept "embraces a diversity of manifestations of the interaction between humankind and its natural environment."[31] Though the *Operational Guidelines for the Implementation of the World Heritage Convention*[32] also recognise naturally developed landscapes and associative cultural landscapes,[33] that term usually relates to landscapes that were physically transformed by humans,[34] for example by terracing hillsides, changing watercourses or laying out paddy fields.

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[28] Kerry Emanuel, "Increasing Destructiveness of Tropical Cyclones over the Past 30 Years" (2005) 436 *Nature* 686; Jeffrey P. Donnelly and Jonathan D. Woodruff, "Intense Hurricane Activity over the Past 5,000 Years Controlled by El Niño and the West African Monsoon" (2007) 447 *Nature* 465 et. seqq.; Johan Nyberg et al, "Low Atlantic Hurricane Activity in the 1970s and 1980s Compared to the Past 270 Years" (2007) 447 *Nature* 698.

[29] For further information on Hurricane Katrina and its effects, see the report from the National Hurricane Center of the United States from 20 December 2005, available at <http://www.nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf>.

[30] *Operational Guidelines for the Implementation of the World Heritage Convention*, para 47.

[31] *Guidelines on the Inscription of Specific Types of Properties on the World Heritage List*, para 8.

[32] Hereafter: "Operational Guidelines".

[33] For definitions of the three main categories, see *Guidelines on the Inscription of Specific Types of Properties on the World Heritage List*, para 10.

[34] Lesley Head, *Cultural Landscapes and Environmental Change* (Arnold, London) (2000) at 13.

Cultural landscapes are formed by the interdependence between landscape and people[35] and often relate to the endeavour of the local population to gain control over ecological processes to cultivate the land.[36] This for example applies to the mountainous regions of rural China, where the people could only survive by transforming the landscape to meet their needs. The local population in those areas often had to adapt to the landscape and transform it in order to sustain their communities. This created unique ecological habitats,[37] which attracted diverse animal species that only exist in their proximity and became a significant part of the areas' biodiversity. The local population constantly has to maintain them in order to preserve the flora, secure ecological stability and prevent soil erosion. Without the local farmers and their continuous activities, this knowledge and the cultural landscapes will be lost very quickly, which would affect the local cultural heritage, plant life and animals equally.[38]

A further result of that development is the creation of very diverse rural architecture and customs of the local residents, which reflects their intense interaction with their environment. Houses were built from materials that the area had to offer and in a way that met the geographical conditions. This led to a strong regionalization in Chinese rural areas, which spawned an enormous cultural diversity and is still important for preserving their identity.[39]

Climate change poses an additional and very serious threat, especially because such cultural landscapes are often quite fragile due to their complexity. A slight change of temperature, rainfall or extreme weather events can permanently harm those ecosystems and make agriculture more difficult. In case the paddocks cannot sustain the local farmers anymore, they will be forced to abandon those areas, which would inevitably mean the end of those ecosystems. Furthermore, most of the farmers would be forced to leave the area in order to find other ways to feed their families, which would also mean the end of those unique

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35 Johannes Müller, *Kulturlandschaft China: Anthropogene Gestaltung der Landschaft durch Landnutzung und Siedlung* (*Cultural Landscape China: Anthropogenic Creation of the Landscape by Land Use and Housing Development*) (Justus Perthes Verlag, Gotha) (1997) at 20.

36 Ibid. at 333.

37 Ibid. at 336.

38 Stefan Gruber, note 8 at 287 et seqq..

39 Johannes Müller, "Die traditionelle Ländliche Architektur Chinas in ihrem landschaftlichen Kontext" (China's Traditional Rural Architecture in its Regional Context) (1999) 130 *Die Erde* 205 at 222.

regional communities. Many cultural landscapes created by humans are as dependent on the local population as the other way around. If the local population has to move on, it also means the end of the traditional local architecture as the houses would not be preserved anymore by their inhabitants. This would be a very serious additional loss of cultural heritage as regional rural architecture marks a clear contrast to the often very uniform urban architecture. It would also contribute even further to the current trend of urbanisation, which is additionally fuelled by commercialisation and economic influences on rural areas by the expansion of metropolitan areas, which have serious impacts on fragile rural economies.[40]

3 POSSIBLE LEGAL AND POLICY RESPONSES TO THE THREATS OF CLIMATE CHANGE

There is a wide range of laws which can play their part in ameliorating the threats posed by climate change. They include various areas of environmental law such as heritage conservation law, pollution law, land use law, construction law, water law, environmental impact assessment law and planning law. However, given the specific threats of global climate change, law and policy should be used in a holistic way in order to respond to these threats.

3.1 United Nations Framework Convention on Climate Change

The central convention in this context is of course the UNFCCC with its Protocols, Annexes and other climate change-related legal instruments. "The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve (…) stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."[41]

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[40] Stefan Gruber, note 8 at 287.

[41] Article 2 of the United Nations Framework Convention on Climate Change.

The achievements of those aims will likely play a significant role in the survival of humankind and many of the globe's ecosystems. However, as Earth's climate reacts only very slowly to any significant cuts of carbon emissions, greenhouse gas concentrations will keep rising in the near future regardless of any countermeasures. This also means that the climate will keep changing and the consequences mentioned above will become more serious over time. Mitigation strategies can only delay and decrease the severity of climate impacts and can therefore never fully substitute for adaptation.[42] Despite the urgency of reducing carbon emissions, the time where it was possible to only focus on means of prevention has long passed. It is an undeniable fact that climate change is already happening. This is why the focus of countermeasures must also be on adaptation, which especially applies to cultural heritage, as it would be disastrous to wait for climate change to slow down. Therefore the focus of this paper is on adaptive measures and regulation with only passing reference to mitigation. However, mitigation and adaptation are no antipodes, but closely interlinked. The more successful mitigation activities are, the easier it is to adapt to the impacts of climate change.[43]

3.2 World Heritage Convention

The most significant international convention on protection of heritage sites is the *Convention Concerning the Protection of the World Cultural and Natural Heritage* (World Heritage Convention) of 1972. The purpose of this Convention is the protection of the world cultural and natural heritage by establishing "a system of international co-operation and assistance designed to support States Parties to the Convention in their efforts to conserve and identify that heritage."[44] The World Heritage Convention defines cultural heritage as monuments, groups of buildings, and other sites of outstanding universal value from the point of view of history, art or science.[45] Once submitted by the State Party, the cultural heritage that meets these criteria may be included in the World Heritage List[46] by the World Heritage

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[42] Mohan Munasinghe and Rob. J. Swart, *Primer on Climate Change and Sustainable Development: Facts, Policy Analysis and Applications* (Cambridge University Press, Cambridge) (2005) at 172.

[43] Ibid. at 179.

[44] World Heritage Convention, Art. 7.

[45] See ibid, Art. 1.

[46] Ibid., Art. 11 (2).

Committee.[47] The World Heritage Committee also established *Operational Guidelines for the Implementation of the World Heritage Convention*, which *inter alia* give a detailed definition of the term "outstanding universal value"[48] for cultural and natural heritage and their criteria.[49] They also introduce cultural landscapes as an additional category of World Heritage.[50]

The States Parties are obliged to maintain the integrity of the identified outstanding universal value of their listed properties and accord them the highest level of protection possible on a permanent basis.[51] However, those duties do not completely depend on the inclusion of properties in the World Heritage List, but also apply to heritage on tentative lists of sites for possible nominations for inscription at a later point in time.[52] After a State Party has identified a site and forwarded its nomination, a refusal by the World Heritage Committee does not lower the importance of the site to the nation. Under the Convention, States Partes are still obliged to protect and conserve their heritage to the utmost of their resources after having it identified as being worthy of nomination.[53] This obligation arises from the duty to identify a nation's heritage, as required by Article 3 and 4. While the State Party might not be eligible for international assistance if the property is not listed, its obligations under the World Heritage Convention still remain.[54]

Nevertheless, the World Heritage Convention leaves it mostly to the States Parties to decide how to meet their obligations under this Convention as appropriate to each country, recognising their individual policies, legal conditions and different availabilities of resources. It is their sole duty to identify, protect, conserve and present the heritage located on their territories. In addition to this, Article 6 obliges the States Parties to fully co-operate in the protection of World Heritage sites, to assist other States Parties with fulfilling their duties

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47 Ibid., Art. 8.

48 Operational Guidelines, para 49-53.

49 Ibid, para 77.

50 See ibid., para 47 and Guidelines on the Inscription of Specific Types of Properties on the World Heritage List, para 6–13.

51 Ben Boer and Graeme Wiffen, *Heritage Law in Australia* (Oxford University Press, South Melbourne) (2006) at 86.

52 See Operational Guidelines, para 62-76.

53 Ben Boer, note 9 at 91.

54 Stefan Gruber, note 8 at 264.

upon request and to refrain from any wilful destruction of such sites. However, it has to be noted that the World Heritage Convention does not include any enforcement mechanisms.

3.3 The World Heritage Convention and climate change

The World Heritage Convention does not mention climate change specifically, but some of its effects are referred to in Article 11 (4), such as accelerated deterioration of heritage sites, abandonment for any reason, serious fires, landslides, changes in water level, floods and tidal waves. While climate change receives no specific reference in the World Heritage Convention as it was not contemplated when the Convention was drafted, it seems obvious that the obligations of the States Parties also cover the protection of their World Heritage Sites against any threats from climate change. This also applies to the level of efforts that they are expected to make: "[The State Party] will do all it can to this end, to the utmost of its own resources and, where appropriate, with any international assistance and co-operation, in particular, financial, artistic, scientific and technical, which it may be able to obtain." Consequently this also covers the obligation of the States Parties to do everything at their end to prevent further climate change from occurring.[55] It could also be seen as an obligation to do anything to the utmost of their own resources to support the goals of the UNFCCC and all related legal instruments.

The World Heritage Committee expressed its awareness of the threats from climate change to World Heritage at its 29th session in Durban and initiated expert meetings together with its Advisory Bodies.[56] A document with the outcomes of those meetings named "Predicting and Managing the Effects of Climate Change on World Heritage" was presented at the 30th session in Vilnius.[57] As a result of those discussions the World Heritage Committee is now considering to take climate change into account when revising the Operational Guidelines again.[58] Specific amendments to several Paragraphs of the

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[55] See the Precautionary Principle: Nicolas de Sadeleer, *Environmental Principles: From Political Slogans to Legal Rules* (Oxford University Press, Oxford) (2008) at 91 et seqq. and Brian J. Preston, "The Role of the Judiciary in Promoting Sustainable Development: The Experience of Asia and the Pacific" (2005) 9 *Asia Pacific Journal of Environmental Law* 109 at 103 et seqq..

[56] See Decision 29COM 7B.a. from the 29th Session of the World Heritage Committee (Durban, 2005).

[57] Available at <http://whc.unesco.org/uploads/news/documents/news-262-1.doc>.

[58] Document WHC-07/31.COM/7.1.

Operational Guidelines concerning the monitoring, reporting and management duties of the States Parties and the nomination process of sites with particular focus on boundaries and buffer zones have been suggested.[59] Even though all those issues could still be covered by the existing Operational Guidelines, this might raise additional awareness among the States Parties to threats from climate change when dealing with their World Heritage Sites.

The World Heritage Committee basically has two options available to react to a threat to or possible destruction of World Heritage properties. This is the inscription on the List of World Heritage Sites in Danger or, as a final step, the deletion of the site in question. As noted above, the List of World Heritage in Danger[60] includes World Heritage Sites that are "threatened by serious and specific dangers", such as *inter alia* accelerated deterioration, large-scale public or private projects, armed conflict or serious natural disasters, and for which assistance has been requested.[61] In specific cases World Heritage Sites can be included in that list without a request by the State Party in question or even its consent. "The Committee may at any time, in case of urgent need, make a new entry in the List of World Heritage in Danger and publicize such entry immediately."[62] In case of such a listing, the State Party is obliged to cooperate and meet all requests of the Committee after it has developed a plan of immediate measures to protect the property concerned.

In-danger listing and deletion are very strong measures, which are not appropriate in most cases. Only in the most severe cases where World Heritage Sites are threatened should they be inscribed on the List of World Heritage in Danger. Such a listing can be a strong tool to discourage States Parties from jeopardising the outstanding universal value of their properties. Such a listing recently forced the City Council of Cologne to rethink their development plans around the Cologne Cathedral[63] and might stop the planned construction

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59 Ibid. at 7-9.

60 World Heritage Convention, Art. 11 (4); also see Operational Guidelines, para 177-191.

61 For several forms of assistance, see Article 22 of the World Heritage Convention; note that such a request does not necessarily have to come from the State Party: Ana Filipa Vrdoljak, "Article 13: World Heritage Committee and International Assistance" in Francesco Francioni and Federico Lenzerini (eds), *The 1972 World Heritage Convention: A Commentary* (Oxford University Press, Oxford) (2008) at 228.

62 World Heritage Convention, Art. 11 (4).

63 Diana Zacharias, "Cologne Cathedral versus Skyscrapers: World Cultural Heritage Protection as Archetype of a Multilevel System" (2006) 10 *Max Planck Yearbook of United Nations Law* 273; Ben Boer, "Article 34: The Federal Clause" in Francesco Francioni and Federico Lenzerini (eds), *The 1972 World Heritage Convention: A Commentary* (Oxford University Press, Oxford) (2008) at 359 et seq..

of a bridge across the Dresden Elbe Valley. Those listings were a clear embarrassment not only to the local decision-makers, but also to the German Government and attracted an enormous attention and media coverage. Such an impact would not be possible if such listings were not so rare, especially in developed countries. Therefore, this powerful tool should not be weakened by making too many listings related to climate change even if serious impacts can be foreseen, such as in London.[64] Only immediate threats should be covered. This argument should be seen in the context of World Heritage Sites being additionally protected by constant monitoring[65] through the World Heritage Committee's Advising Bodies IUCN[66] and ICOMOS.[67] Furthermore, States Parties are obliged to report on their properties on a regular basis.[68] Eventual threats can be revealed through those mechanisms in order to plan and carry out appropriate countermeasures and to organise international assistance if needed.

3.4 Cultural heritage in arctic and alpine regions

The options for protective measures in arctic and alpine regions are quite limited because the deterioration of permafrost cannot be stopped by anything at all except drastic reduction of climate change. Increased monitoring is the only action that is promising as it at least allows identifying the hastening decay of cultural heritage sites or increased threats from landslides or coastal erosion. In this way, some buildings and structures might possibly be moved or at least salvage operations may be undertaken. Further, urgent maintenance tasks can be planned and carried out.

The specific requirements for protecting cultural heritage sites in Polar Regions are *inter alia* recognised in the *Protocol on Environmental Protection to the Antarctic Treaty*[69]

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64 UNESCO World Heritage Centre, note 4 at 67.

65 See Ben Boer, "Article 29: Reports" in Francesco Francioni and Federico Lenzerini (eds), *The 1972 World Heritage Convention: A Commentary* (Oxford University Press, Oxford) (2008) 335-343.

66 World Conservation Union.

67 International Council on Monuments and Sites.

68 World Heritage Convention, Art. 29.

69 Available at <http://www.ats.aq/documents/recatt/Att006_e.pdf>.

and especially its Annex V[70]. Sites may be designated Antarctic Specially Protected Areas, which require the drawing up of a management plan. Any activities and entering may only be undertaken in accordance with that plan in order to minimise any impacts. Examples include the comprehensive *2001 Mawson's Huts Conservation Management Plan*[71] and the *Mawson's Huts Historic Site Management Plan 2011-2012*[72], which clearly reflect the attention that the Australian authorities give to the site. The site is also listed as an Antarctic Treaty Historic Site and Monument besides being inscribed in the *National Heritage List* and the *Commonwealth Heritage List* of Australia.

3.5 Legal instruments to combat desertification

One of the key issues of protecting cultural heritage sites from the effects of climate change is the prevention of further desertification. The UNCCD clearly provides responsibility at the level of States Parties as well as local communities, which makes sense regarding cultural heritage sites.[73] People in local communities in dry areas are the first to discover any vital changes in the health of their ecosystems and can react to droughts and water shortage the most expeditiously.

However, there is need for more decisive action at the state level for the guidance of local communities, as local decisions based only on short-term economic aims should be avoided. The effects of development often prove to be severe in dry regions. Many cultural heritage sites are tourist destinations and attract tourist development projects, which often even include swimming pools and golf courses despite serious water shortages. Even if they provide the community with short-term income, they can permanently harm the local environment. In dry areas where water is more precious, development projects must be designed so as not to deplete the ground water to an unsustainable level. This means that

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70 Available at <http://www.ats.aq/documents/recatt/Att004_e.pdf>.

71 Available at <http://www.aad.gov.au/default.asp?casid=13874>.

72 Available at <http://www.aad.gov.au/MediaLibrary/asset/MediaItems/ml_396156811342593_MawsonsHutsMangPlanFinal.pdf>.

73 An overview on different legal approaches to combating desertification, see Alon Tal and Jessica A. Cohen, "Bringing “Top-Down” to “Bottom-up”: A New Role for Environmental Legislation in Combating Desertification" (2007) 31 *Harvard Environmental Law Review* 163.

development projects will often need to be strictly limited in size and not include unsustainable features. The same applies to deforestation and agriculture focusing on the cultivation of plants with high water requirements that are not suited to dry climates.[74] As soon as a dry area turns into a desert, the damage is virtually irreversible.

Efficient regulation in that area is only possible through a combined application of water law, land use law and construction law. In order to protect the water supply, constant monitoring is needed. This allows not only local, but also federal and provincial authorities to react to droughts. Otherwise the pursuit of short-term interests by developers could harm a whole region on a permanent basis. In developing regions, free trade among the countries and the development of strategic food depots is also an essential step.[75] This would certainly contribute to a reduction of soil degradation in dry areas, as especially "desperate" irrigation projects put too much pressure on the often highly vulnerable soil.

However, many cultural heritage sites are already located within desert areas. At such sites the creation of buffer zones is essential in order to protect them from being covered by sand. Existing sand encroachment must be removed continuously. Increased monitoring at more remote sites is also necessary.

3.6 Protective measures against flooding

Another serious threat comes from the constant rise of the ocean level, heavy rainfall and rapid melting of glaciers and snow. The only protection possible against resulting flooding is by constructing wide systems of embankments or sometimes even moving heritage structures. Again, constant monitoring of threatened sites is needed, though the main focus has to be on drafting plans for effective coastal and river embankments.

Such measures against the effects of climate change are expensive. While it is already difficult for wealthier countries to set aside large amounts of money if there is no direct and visible benefit, the situation for poor countries is even worse.[76] However, the pending loss often exceeds those expenses by far. UNESCO expects that a single overtopping of the

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[74] For an overview on the current Spanish endeavours, see Cristina Narbona, "Gaining Ground" (2006) 17 *Our Planet* 6.

[75] Ian H. Rowlands, "Regional Approaches to Global Climate Change Policy in Sub-Saharan Africa" in Pak Sum Low (ed), *Climate Change and Africa* (Cambridge University Press, Cambridge) (2005) 150 at 154.

[76] Jonathan Cowie, note 10 at 457 et seqq..

Thames barrier would cause damage to the amount of GBP 30 billion to the British economy.[77] Such a flood would at least submerge the three World Heritage Sites closest to the river[78] and have an impact on the many historic sites along the riverbanks.

One of the most drastic recent examples was the Hurricane Katrina, which hit New Orleans in 2003. Besides taking many lives, it caused damage of over USD 80 billion. The city will never regain its former appearance. This is even more tragic as a protection plan had been developed, the implementation of which would have cost approximately USD 14 billion. Though this constitutes a considerable investment, it is still significantly less than the actual damage to the city without including the loss of life, the psychological damage to its inhabitants and the irrevocable loss of heritage sights. This shows how important it is that planning law makes protection plans compulsory for areas threatened by flooding.

3.7 Protection of rural cultural landscapes

Cultural landscapes are threatened by many factors, with climate change putting additional stress on them. Rural landscapes are especially threatened by further urbanisation and exodus of people from rural communities in many parts of the world. If agricultural production further declines because of climate change, whole cultural landscapes could be lost in remote areas that are difficult to cultivate. As discussed, this would have massive implications for local villages, traditional ways of living, ecosystems and animals.

Minorities are often affected even more, as they usually live in remote areas, which is a circumstance that sometimes secured their survival as homogenous groups. However, what originally secured their survival might increasingly threaten them if climate change makes their area less fertile. If parts of their community were forced to leave their homes and move to the metropolitan areas, it would also mean a serious loss of intangible heritage. Traditions and communal life can hardly survive if minorities merge into metropolitan areas.

Protecting rural cultural landscapes proves to be difficult as they must not only be protected from external pressure, but the population also has to be provided with a sustainable access to resources. Land use law and laws protecting the rights of minorities, if applicable, can provide possible legal protection by minimising development pressure and supporting the local people. Possible support could be provided by assisting in adapting agriculture to

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[77] UNESCO World Heritage Centre, note 4 at 69.

[78] The National Maritime Museum, the Tower of London and the Palace of Westminster.

possible climate change-related challenges and to assist the communities with developing additional ways to create income. The main challenge will be to reduce the effects of climate change on the local ecosystems, while minimising the negative effects for the local population in order to safeguard it from destruction by further urbanisation. One of the possible approaches includes the establishment of large and connected protected areas with buffer zones and migration corridors for wildlife. Furthermore, local farmers could be supported by pricing and marketing policies and enhanced land and resource management. This would certainly help them to compensate for declining crop and supplies. However, one of the key issues will always be the prevention of further soil degradation and the protection of water supplies to secure future irrigation.[79] Land use, water and environmental impact assessment regulations will play a significant part in fulfilling those aims.

4 CONCLUSION

This paper has indicated the diversity of threats of climate change to cultural heritage sites and how difficult it is to develop effective protection mechanisms. Only be using laws in an integrated way, a comprehensive system of legal instruments and enforcement mechanisms can be formulated in order to minimise the effects of global climate change on heritage properties. This often involves laws that at first do not seem to be related. However, because of the combination of threats, regulatory instruments drawn from the areas of heritage conservation law, land use law, construction law, water law, environmental impact assessment law and planning law must be applied in a holistic manner, rather than focusing only on specific sectoral issues. This also applies to potential climate change litigation that can be expected to play a significant role in the future.[80]

As heritage sites are regarded as non-renewable items, it is important to examine possible precautionary measures to potential threats as early as possible. Given the risks and mostly irreversible harms it would be irresponsible to wait for absolute certainty before carrying out effective mitigation and adaptation measures.[81] Since the effects of climate

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[79] Mohan Munasinghe and Rob. J. Swart, note 42 at 242.

[80] Joseph Smith and David Shearman, *Climate Change Litigation: Analysing the Law, Scientific Evidence & Impacts on the Environment, Health & Property* (Presidian Legal Publications, Adelaide) (2006) at 12.

[81] Andrew Emory Dessler and Edward Parson, *The Science and Politics of Global Climate Change : A Guide to the Debate* (Cambridge University Press, Cambridge) (2006).

change are inevitable, gambling is not an option due to the unacceptable risks.[82] Despite the significant investments needed, too much is at stake. Only by combating global warming, implementing comprehensive adaptation measures and undertaking constant monitoring is it possible to preserve humankind's cultural heritage and to pass it on to future generations. The preservation of diversity in our civilisation is one of the core challenges of heritage protection[83] as a loss of such sites often means not only permanent harm to local populations and economies. "Deterioration or disappearance of any item of the cultural or natural heritage constitutes a harmful impoverishment of the heritage of all the nations of the world".[84]

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[82] See note 55.

[83] Stefan Gruber, note 8 at 256.

[84] Preamble of the World Heritage Convention.