

THE ENVIRONMENTAL IMPACT OF WAR & TERRORISM

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Introduction

Much has been written about the impact of war and terrorism on peoples' lives and there is no doubt that such impacts are detrimental to human physical and mental well being in the short and long terms. However, war and terrorism also have a considerable environmental impact by altering urban and rural landscapes to leave a variety of legacies which bear witness to past and recent conflicts (see Mannion, 2002 for a brief review). The vestiges of the destructive forces of hostility occur around the world. They reflect the direct and indirect environmental effects of conflicts and are a testament to human failure to find non-combative solutions to disputes.

The many environmental impacts of hostility include the infrastructure necessary for the preparation for war, including training grounds, camps, barracks, weapons testing etc. However, the immediate impacts of war, and of terrorism, are usually sudden and dramatic, and can be either direct or indirect. Direct impacts include bomb and blast damage to settlements, rural areas and communication networks. Defoliation and ecosystem destruction, the dumping of the machinery of war and the destruction of resources such as oil fields also occur. Indirect impacts are many and varied and are often longer-lasting than the direct impacts. They include the construction of various camps such as refugee camps, and the distortion of population composition as young males join the conflict; in countries where agriculture is a major activity this may result in land abandonment and degradation may ensue. Other indirect impacts include loss of wildlife as animals are hunted for bush meat. Particularly long-lasting effects include the use of land for war graves, war memorials and museums. Along with battlefields themselves these reminders of conflicts have, in many nations, become the focus of the tourist industry and thus a source of wealth generation. The locations of the cities and countries referred to in this paper are given in Figures 1 and 2.

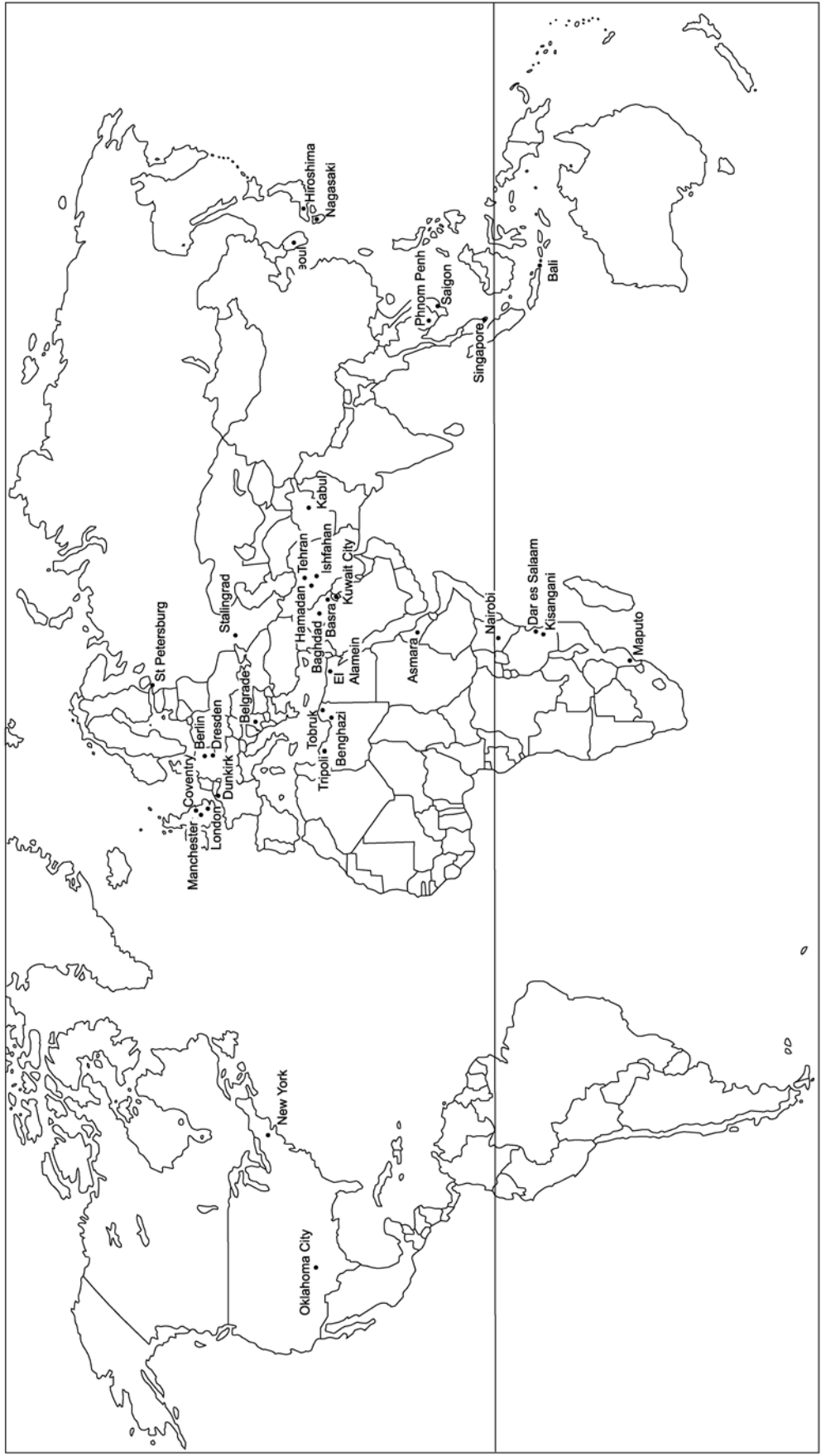


Figure 1 The location of cities referred to in this paper

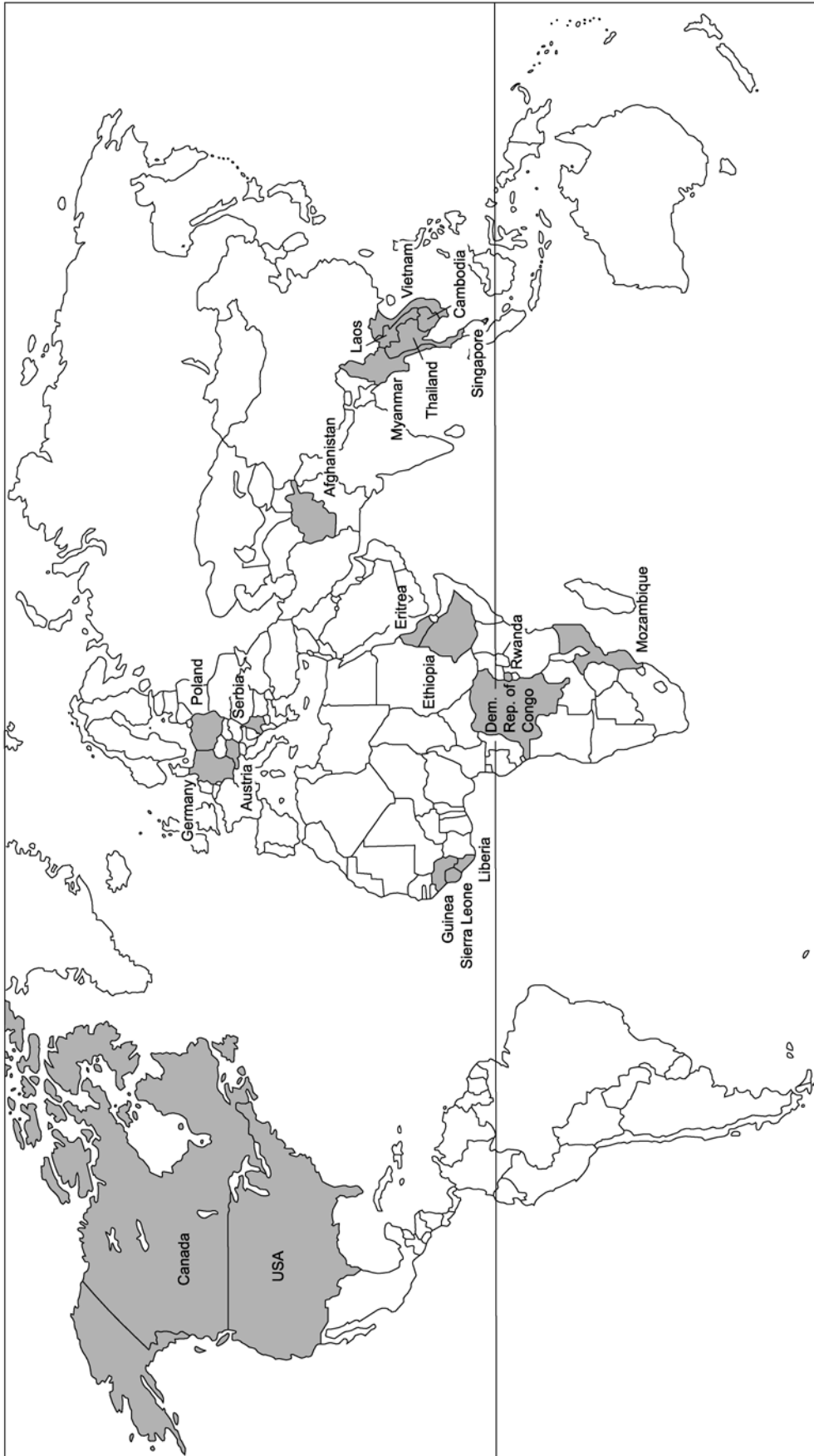


Figure 2 The location of countries referred to in the text

Direct Impacts

The immediate and direct impacts of war and terrorism are obvious. The effects on landscapes can be as devastating as earthquakes or volcanic eruptions as buildings collapse and craters develop. For example, many European cities were substantially altered by bombing raids during World War II. Examples include London, Coventry, Berlin and Dresden. In Berlin 125,000 people died, half of the buildings and one third of the industrial plant were razed to the ground. Inwood (1998) states that 20,000 lives were lost in the capital during the Blitz alone, a short period of bombardment which occurred between September 1940 and March 1941 when c.240 hectares of the city were damaged; a further 10,000 people died during World War II. As recorded in *The Times History of London* (1999) much damage to the cityscape occurred in the area known as the City, the site of Roman *Londinium*, though St Paul's cathedral escaped significant damage. During this period many people moved out of central London accelerating the process of suburban development which began in the 1930s and which continued post 1945.

Dresden in Germany suffered vast damage in bombing raids of January 1945 when 50,000 people died and nearly 650 hectares of the city, including many architecturally-acclaimed buildings, were destroyed. Figure 3 shows the central area of Dresden that was targeted and carpet bombed. In 1942-43 immense damage by bombs was also perpetrated in Stalingrad (now Volgograd), central Russia, where 40,000 civilians died in air raids along with 624,000 Soviet and German troops and 91,000 soldiers became prisoners of war. There is a battlefield memorial at Mamaev Kurgan, 3 km from the city centre, with a statue of Mother Russia and a museum. The repair and rebuilding of these cities in the post war period brought about further change in their cityscapes.

In the last four decades many other world cities have been profoundly altered by armed conflict; they include Phnom Penh in Cambodia, Saigon (now Ho Chi Minh City) in Vietnam, Kabul in Afghanistan and Kuwait City. In the last 21 days (March-April, 2003) many cities in Iraq have been bombed as régime change is effected. The cities of Basra and Baghdad, for example, have been subject to considerable bombardment and their cityscapes have been dramatically altered. The targets have comprised the many presidential palaces, military installations and government buildings. Those of Baghdad

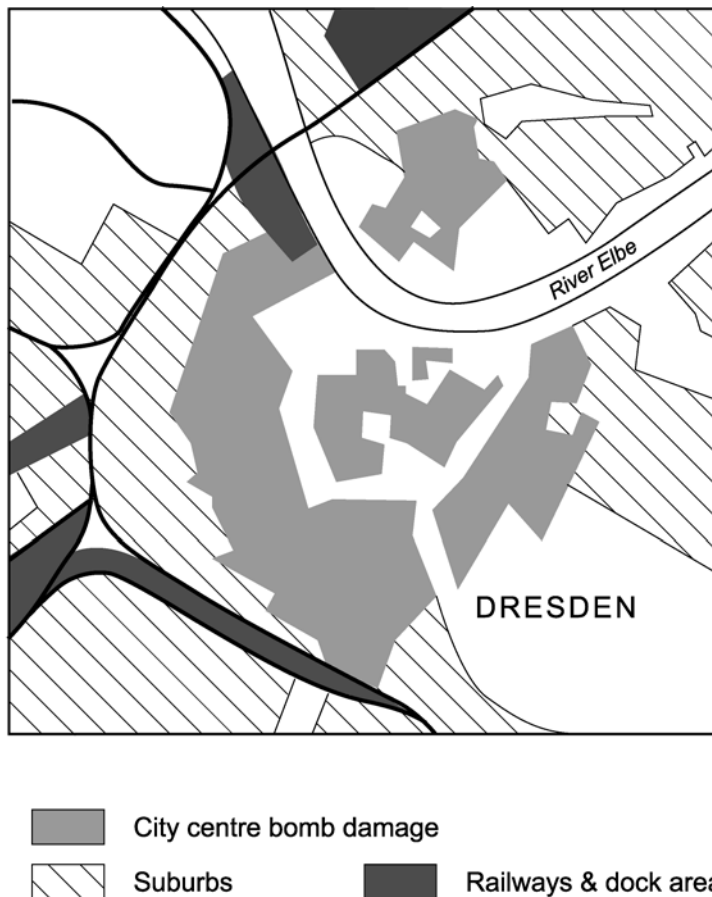


Figure 3 The major area of bomb damage during World War II in Dresden, Germany (based on a British Library image, 2003)

are shown in Figure 4. However, no cities have been as devastated as Hiroshima and Nagasaki, southern Japan, on which the first atomic bombs were dropped on 6 August 1945. 100,000 were killed immediately in Hiroshima and 40,000 people in Nagasaki and the human- health legacy of this action remains in evidence today. The almost complete destruction of both city centres necessitated a massive post-war rebuilding programme and the atomic fallout affected the flora and fauna over a wide area.

More recently, the conflict in the Balkans involved NATO bombing raids on Belgrade and surroundings in 1999. The resulting damage and pollution has been documented in newspaper and newsletter reports such as those by Conachy, 1999, and Haavisto, 2000. The damaged petro-chemical plants in the suburbs leaked hazardous substances into the air, water and soil. Other targets included factories producing ammonia and plastics resulting



Figure 4 The major bombing targets in Baghdad during the war on Iraq; March - April 2003

in the release of chemical such as chlorine, ethylene dichloride, hydrochloric acid and vinyl chloride causing local air pollution and health hazards. The release of oil and other chemicals from such plants and refineries has also contaminated above- and below-ground water courses in Serbia. For example, extensive oil slicks occurred in the Danube which was also contaminated by a variety of other chemicals, e.g. hydrochloric acid and mercury compounds. Inevitably, such pollutants affected river flora and fauna, not only in Serbia but also in nations downstream such as Romania and Bulgaria.

The destruction of oil wells in Kuwait during the Gulf war of 1990-1991 also caused widespread environmental contamination. Iraqi troops released about 11 million barrels of oil into the Persian Gulf. This affected approximately 1290km of the region's coastline, notably in Saudi Arabia and Kuwait. Local fishing industries and many marine species, such as turtles, whales, dugongs and sea birds, have been adversely affected. CNN reports indicate that retreating Iraqi soldiers more than 700 oil wells alight (McClain, 2001). This could be considered as a gross act of ecoterrorism as there was no military advantage to be gained.

The production of soot, and gases such as carbon dioxide and sulphur dioxide, caused pollution episodes within and beyond the region. Acid rain was generated and soot particles temporarily lowered temperatures as sun light was radiated back into the atmosphere. Oil-pool formation, the deposition of oil droplets in the desert sand and accumulation of heavy metals is still evident though considerable recovery has occurred in marine and coastal ecosystems such as mangrove communities and coral reefs (see Price, 1998).

Urban landscapes have also been altered by terrorist attacks. No reminder is needed of the devastating effect of the loss of New York's World Trade Centre in September 2001; New York's skyline and cityscape will never be the same again. In Oklahoma City a truck-bomb exploded outside the Alfred P Murrah Federal Building on 19 April 1995 killing 168 people. The bomb site is now occupied by a City national memorial. Manchester in the UK was also the subject of a terrorist attack; a new shopping centre has now replaced the buildings destroyed on June 15 1996 by an IRA bomb, the largest bomb in mainland UK since World War II. Similar incidents involving car bombs in Nairobi, Kenya, and Dar es Salaam, Tanzania caused the loss of 250 and 10 lives respectively, and more than 5000 injured in Nairobi, as US embassies were targeted on 7th August 1998. Moreover, the devastation wrought by the terrorist bombing of the resort of Kuta on the island of Bali, Indonesia, on October 13 2002 is still in evidence. More than 50 people, mainly holidaymakers, lost their lives as the Sari nightclub was demolished and Bali's tourism industry has been traumatized (see report by Brace, 2002).

Bomb damage in rural areas may not cause as much loss of life as it does in cities but a legacy remains nevertheless. In Vietnam and Laos, for example, agricultural areas are characterized by numerous duck and fish ponds that originated as bomb craters during the Vietnam War of 1964 to 1975. It has been estimated that 25 million such craters between 6 and 30m in diameter were created, that more than one million hectares of forests were destroyed and that two million hectares of agricultural land were rendered unproductive (see R.P.Shaw, 1989). The latter was undertaken to curtail food supplies and to reduce the possibilities for the Viet Kong to evade their pursuers. Forest, mangrove and crop defoliation involved the use of several herbicides, including Agent Orange, a combination of two phenoxyacid herbicides, dioxin impurities in which have caused serious health problems for US personnel and Vietnamese. A recent reappraisal of the extent of spraying by Stellman *et al.* (2003), using previously overlooked data on flight-paths, the spray components and quantities as logged by pilots, shows that an additional 7×10^6 to 9.5×10^6 litres of herbicides were used than originally calculated by NASA in 1974. The greatest volumes of herbicides were sprayed in the southeast in the hinterland of what is now Ho Chi Minh City. Although much of the forest and agricultural land has now recovered the impact of war remains evident as do the human health problems, the extent of which have yet to be ascertained in the light of these new data.

Further aspects of land alteration due to war include the construction of camps for armed forces and the exploitation of resources by entrepreneurs who identify opportunities for financial gain. Although ephemeral, camps cause impairment of soil and vegetation through trampling by personnel and vehicles and the disposal of waste materials. Another environmental impact is evident in Eritrea's 'rust bowl'. This comprises a so-called tank graveyard on the outskirts of the capital, Asmara. Here, several hectares are covered with derelict army tanks, armoured cars and jeeps deriving from the 30-year war with Ethiopia. This came to an end in 1993 when Eritrea gained independence.

An example of war-related entrepreneurship which brought about environmental change is that of the activities of charcoal producers in the hinterland of Maputo, Mozambique's capital, during the 1984-1992 war. The demand for fuel wood in Maputo increased markedly because of increased population as people fled there to avoid the areas of active conflict but at the same time the people traditionally engaged in planned and organized charcoal production in the countryside had been dispersed, often to the neighbouring

countries of South Africa and Swaziland. Groups of young Mozambique males appropriated the vacated role of charcoal burners and traders though their approach was very different to that of their predecessors. This is described by McGregor (1998) who states that 'Operating in a war- zone they (the charcoal burners) were concerned with short term gain and minimising personal risk, so they clear-felled the areas where they were based. As trees were cut, burners moved out during the day, withdrawing in the evening to avoid attack. New settlements were created when old areas were devoid of trees'. Moreover such an unplanned and opportunistic approach persisted for sometime after the war.

Indirect Impacts

Refugee camps, refugee influx into urban areas and other camps

War is one of the most significant causes of migration as people flee the theatre of conflict. Not only do bombs, artillery etc cause civilians to vacate their houses and lands but so do invading armed forces, land, building, food and resource acquisition. Many past and recent conflicts have caused mass migrations to neighbouring countries where refugee camps have been established to provide basic shelter and food. Some of these camps have been short lived but others have become permanent settlements. Whatever the case, and whatever the cause which may be famine, natural disasters and resource conflicts rather than war, refugee camps cause rapid and drastic environmental change. According to the United Nations High Commission for Refugees (UNHCR Statistics, 2003) there were approximately 23 million refugees in 2002, a number increasing daily; approximately nine million are in Asia, five million in Europe and more than four million in Africa. Major causes in recent times include conflicts in Eritrea/Ethiopia, Mozambique, the Balkans, Sierra Leone, Liberia, Rwanda and Afghanistan which have resulted in the displacement of millions of people.

The resulting refugee camps offer basic food and shelter but even the provision of such meagre resources requires massive organization on the part of host nations and international aid agencies. Moreover, enormous pressure is exerted on landscapes which are often already fragile. The vegetation is destroyed where the camp is established; vegetation in the hinterland is also altered, especially woody vegetation which is exploited as a source of fuel, and because wild animals are exploited as a source of protein their

populations will be considerably reduced and the browsing habits of individual species may be altered. Water availability and water quality may also become problematic, not only because of scarcity but also because of real and potential health hazards such as cholera and typhoid. In addition, it is necessary to dispose of domestic and human waste products which also have an environmental impact as well as posing potential health hazards.

Environmental impacts such as these have occurred in the Democratic Republic of Congo (DRC, formerly Zaire), the recipient of refugees from the Tutsi-Hutu conflict in Rwanda in the mid 1990s and itself the subject of civil unrest, and in Afghanistan where internal conflict has been occurring for more than two decades. According to UNHCR reports (see www.unhcr.org.ch) more than 300,000 Rwandan refugees took shelter in the DCR, initially in the east of the country but moving west, as rebel forces pushed back Zaire government troops, to establish new camps in the vicinity of Kisangani. Great pressure was placed on forests to provide fuel (often as charcoal) and food, not only out of necessity but also because entrepreneurs exploited the situation to provide these relatively scarce commodities to refugees and locals alike. The longer camps last, the greater the environmental impact becomes. Indeed, even short-lived impacts have long-lasting effects and in many instances the environment may never fully recover as pressure on vegetation, soils and wildlife results in the breaching of ecological thresholds.

The UNHCR has addressed this type of environmental impact by providing truck loads of firewood for refugee camps (100 truck loads in DCR), and by sponsoring reforestation programmes. However, and by UNHCR's own admission, this policy has only partially succeeded because of the huge cost of transport for firewood and because it has proved impossible to provide more than c.33 per cent of the firewood needed. The immediacy and significance of this problem cannot be underestimated whether the context is sub-Saharan Africa, the Mediterranean Balkans, semi-arid central Asia or tropical Indochina. Moreover, wood is vital for reconstruction in the aftermath of war. As Wilkinson states in the UNHCR publication *Refugees* (No 127, 2002) 'Afghanistan is so short of wood millions of dollars worth of timber will be imported from as far away as South Africa and Tanzania to help rebuild the country'.

Although the magnitude of the environmental impacts of refugee camps is considerable, it must be stated that it is relatively minor in comparison with the overall impact of humanity

on the face of the earth. Moreover, each environment reacts uniquely to human pressure. Some of the environmental impacts of refugee camps, and refugee influx into existing settlements, are illustrated by the case the case of Guinea, West Africa, which was documented in a report from the United Nations Environment Programme (UNEP) in 2000. Guinea's southern and western border areas have been receiving refugees from armed conflicts in neighbouring Liberia and Sierra Leone since 1989. At the peak of conflict there were some 800,000 refugees; by 2000 there were 320,000 'official' refugees, i.e. those registered with UNHCR, though in reality the figure may be more like 600,000, especially when taking into account non-registered displaced people who have migrated to Guinea's urban areas. The impact, both environmentally and socially, has been considerable in what is one of the world's poorest countries and one which already has its share of environmental problems.

In respect of the numerous refugee camps which have been established by the UNHCR in Guinea's rural areas, notably Guinea Forestière which has a border with Liberia, there is evidence for accelerated deforestation, forest degradation and loss of swampland. Apart from the need for fuel wood, deforestation and forest degradation have occurred as land has been brought under cultivation; this is also the main reason for the drainage of swampland. In the Gueckedou area, for example, the area of natural forest has declined markedly and throughout the border area where refugee camps have been established pressures to produce arable crops have resulted in a shortening of the fallow period. This reduction in the time between periods of cultivation means that the forest never fully recovers to its pre-disturbance biodiversity and that the nutrient store is never fully replaced. Crop productivity declines as a result and so enhances the need for yet more arable land. Loss of swampland and tree removal in the area of the Kaliah camp in Forecariah district, near Conakry and close to the border with Sierra Leone, has resulted in the drying up of the water source near the village of Berecore. Here drainage systems have been constructed to facilitate rice production.

The UNEP report also highlights the environmental problems associated with the large influx of refugees to Guinea's urban areas, especially Nzerekore, Macenta, Gueckedou and Kissidougou. Any substantial and sudden influx of people into settlements with poor infrastructure will inevitably stretch the available resources as well as intensifying the pressure on meagre services, such as health care, schools etc. There are four major issues

that relate to the environment: sanitation and water quality, the provision of drinking water, the disposal of waste, and the use of wood etc for building construction and fuel. UNEP states that ‘The towns of southern Guinea as well as in Conakry face the worst sanitation problems in sub-Saharan Africa. A basic sanitation infrastructure is generally missing. Most notable are the small waste dumps all over the villages, the pollution of water streams, and the general inadequacy of pit latrines. Boreholes, to provide potable water, are sometimes dug next to sewage dumps. Epidemics are a serious threat; in the mid 1990s there have been outbreaks of cholera and meningitis, and if the sanitation situation is not improved, other outbreaks can be expected’. The sanitation problem can only be tackled by the provision of more and better latrines; UNEP advocate joint funding by international agencies and local government. The problem of adequate provision of drinking water, not only in urban areas but also in refugee camps, is compounded by the pollution of water courses in a region which is not well served under non-refugee conditions. More wells, boreholes and pumps are necessary. The generation of much increased domestic solid waste also poses problems of disposal and health hazards. Existing municipal waste disposal is inadequate and many towns are unhealthy places to live. Improved disposal facilities are essential with the designation of official sites and the encouragement of recycling programmes.

The hinterlands of settlements are also affected by refugee influx. In particular, land is used for informal settlement and is cleared for agriculture; trees are cut down for construction and forests are exploited as the demand for fuel wood demand escalates. No data are given by UNEP for Guinea, but an UNHCR document (2001) entitled ‘Refugees and the Environment: Caring for the Future’ refers to the impact of refugees on the Virunga National Park, DRC, during the civil unrest. It states that ‘...refugees were removing some 800 tonnes of timber and grass each day from the park – an amount far in excess of a possible sustainable yield’. Overall, some 113 km² of the park were adversely affected of which 62 per cent was stripped of trees. UNHCR also refers to the impact of Rwandan and Burundian refugees on the Kagera region of northwest Tanzania in 1996. Here, 1,200 tonnes of firewood were removed daily, affecting 570 km² of forest with substantial tree removal from c.30 per cent.

Trees and other types of vegetation are not the only components of ecosystems to be affected. For example, Van Krunkelsven *et al.* (2000), report that elephants, gorillas and

other wild animals were killed for food by renegade fighters and Rwandan refugees in the Maiko and Kahuzi-Biega National parks. Indeed, the parks of Mozambique are only now showing signs of recovery following the civil war of 1976-1992. Some of the impacts on wildlife have been examined by De Boer *et al.* (2000). They show that the population, distribution and diet of elephants in the Maputo Elephant Reserve have been altered as a result of increased poaching. Significantly, the habitat preferences of the animals has shifted from open plains to forest which affords them more protection from poachers; this is despite the better grazing available in the open grassland. Moreover, the exploitation of wild animals to generate funds for warfare should not be ignored; ivory and skins can be important sources of income wherever informal income is required.

Many conflicts have given rise to other types of temporary camps, including prisoner of war camps, internment camps, concentration camps and labour camps. All these types of camp were created during World Wars I and II though the British established internment camps in South Africa during the Anglo-Boer Wars (1880-81 and 1899-1902) wherein 26,000 people died. Between 1914 and 1920 some 26 internment camps for c. 5,000 Ukrainians were in operation throughout Canada but with a concentration in Alberta and British Columbia, as shown in Figure 5. These camps, sometimes referred to as Canada's Gulag Archipelago, provided forced labour which was used to in the mining, steel and logging industries as well as the development of Banff National Park (see www.infoukes.com).

During both world wars camps for captured military personnel were constructed throughout Europe and in parts of Asia. Many are associated with war graves and memorials, as discussed below. For example, there were more than 60 prisoner of war camps created by the Japanese in Indonesia, Malaysia the Philippines, China, Thailand, Vietnam and Myanmar as well as in Japan itself, examples include, Kanchanburi and Ban Pong in Siam (now Thailand) and Thanbyuzayat in Burma (now Myanmar) which provided labour for the construction of the Burma-Siam railway, and Changi, Singapore. Examples of internment camps are those constructed in the USA to house German Americans, Italian Americans and Japanese Americans during the later stages of World War II when the USA became directly involved following the bombing of Pearl Harbour, Hawaii, in December 1941. There were ten of these relocation camps or 'prison cities' for Japanese Americans,



Figure 5 Distribution of World War I and World War II internment camps in Canada and USA (based on www.oz.net, infoukes.com and yesnet.yk.ca; 2003)

each with a population of 10,000 to 18,000 people, as well as many so-called Assembly Centres (see Figure 5 for locations); overall 120,000 Japanese Americans were interned (www.oz.net). Approximately 11,000 German Americans were interned in over 70 camps (see Figure 5) and at least 1,100 Italian Americans were interned. Ten such camps were also constructed in Canada for Japanese Canadians; there were three road, two prisoner of war and five self-supporting camps (see www.yesnet.yk.ca); their locations are given in Figure 5.

In relation to concentration camps, the most well known are the hundreds of camps established in Europe, especially in Germany, Poland and Austria which were constructed to house and kill European civilians who were considered to be undesirable to the Nazis. The locations of some of these are given in Figure 6. Examples include Bergen-Belsen, Buchenwald, Dachau, Ravensbrook and Auschwitz. The latter was the largest such camp

and was established in 1940 near the Polish city of Oswiecim. According to the Auschwitz Museum (www.auschwitz-muzeum.oswiecim.pl) it eventually comprised three main and 40 sub-camps and almost 1.3 million people died there of whom 1.1 million were Jews. Today the camp has been preserved as a museum and its significance as a reminder of inhumanity is reflected in its designation as a World Heritage site in 1979. The Bergen-Belsen establishment was both a concentration and prisoner of war camp; it was established

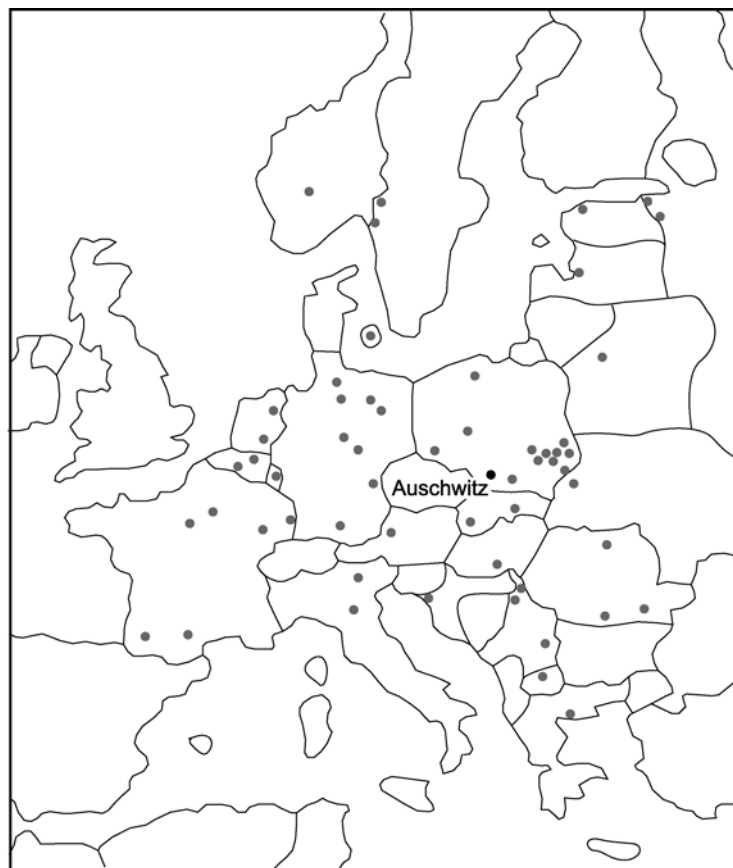


Figure 6 Distribution of major Nazi Concentration Camps in Europe (based on www.us-israel.org; 2003)

in 1942 and was liberated by British troops in 1945. It comprised six sub-camps, a hospital for prisoners of war and a store which eventually became a women's camp. Today, it is preserved as a monument to the dead and there is a Soviet prisoner of war cemetery. Another outcome of World War II was the enlargement of existing Soviet labour camps, the Gulags, which had been constructed across Russia through Siberia and into the Far East and whose inhabitants already numbered some 38 million before the start of World War II.

War graves, war memorials and museums of war

While the direct impact of war on the environment is indeed stark, there are also permanent reminders, such as war graves, memorials and museums, which are distributed worldwide. Not only do these constructions testify to the human costs of war but they themselves represent an environmental impact in relation to land use. War graves and cemeteries are extensive; for example, graves relating to conflicts with the UK and the British Commonwealth are maintained by the Commonwealth War Graves Commission (www.cwgc.org) in 150 countries, as shown in Figure 7.

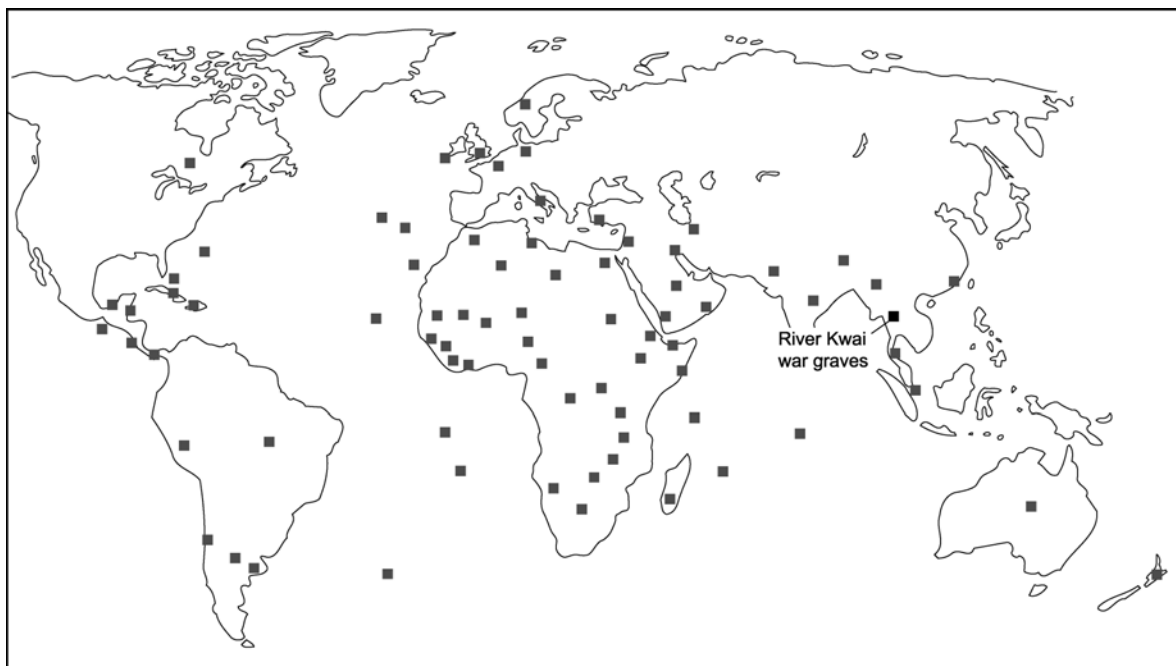


Figure 7 Distribution of British Commonwealth War Graves
(based on Commonwealth War Graves Commission, 2003)

Many of these contain and commemorate the dead of World War II. In the UK itself there are 170,000 war graves in almost 12,500 cemeteries and churchyards. Outside the UK the cemeteries of the Channel ports contain the largest number of graves, many from the 1939-1940 campaign. One of the best known is that of Dunkirk which comprises a memorial as well as graves. The former commemorates the soldiers of the British expeditionary force who have no grave, five from the Royal Indian Army Service Corps and 4,511 from UK land forces. There are 800 British war graves in the Dunkirk Town Cemetery wherein

soldiers from the UK, the British Commonwealth, Czechoslovakia, Norway and Poland. There are also many war cemeteries dedicated to soldiers of World War I located along the border between France and Belgium.

Beyond Europe, the British Commonwealth war cemeteries associated with the forced construction of the Burma – Siam railway, which began in 1942, are amongst the most well known. Location details are shown in Figure 8.

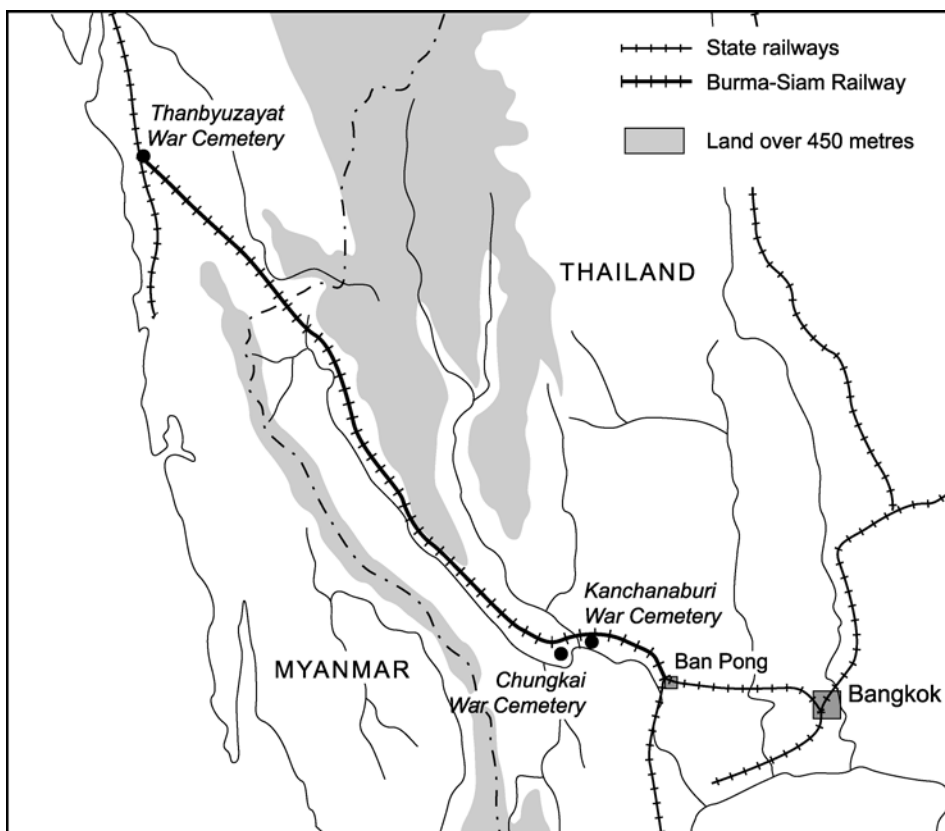


Figure 8 Location of war graves associated with the construction of the Burma-Siam Railway (based on Commonwealth War Graves Commission, 2003)

This railway was built by British, Dutch, Australian and American prisoners of war who, as they defended south-east Asia during World War II, had been captured by the Japanese. The appalling working and living conditions caused the death of c.13,000 prisoners of war. After peace was established the American contingent was returned to the USA while the bodies of the other nationalities were finally interred in three war cemeteries. The two in

Thailand are Chungkai with more than 1,700 burials and Kanchanaburi with almost 7,000 burials, while the cemetery in Myanmar is Thanbyuzayat and contains 3,800 burials. A further six cemeteries attest to the World War II campaign in North Africa i.e. El Alamein, Sollum, Tobruk, Acroma, Benghazi and Tripoli; El Alamein alone contains 7,367 burials while the memorial commemorates 11,874 military personnel who have no known graves.

Cemeteries of Civil War (1861 – 1865) casualties occur throughout the USA as a testament to the only formal war fought *in situ*; the US Civil War Center (www.cwc.lsu.edu) lists 29 cemeteries in 17 states. Every state also has at least one military cemetery relating to international conflicts since the Civil War; there are more than 170 such cemeteries (www.interment.net). Moreover, the USA, through the American Battle Monuments Commission (www.abmc.gov), maintains 24 burial grounds in other parts of the world; there are 11 in France, three in Belgium, two in each of the UK, Italy and Luxemburg, and single cemeteries in each of Mexico, the Philippines, the Netherlands and Tunisia. Overall, there are almost 125,000 burials, some 93,242 of which belong to the American dead of World War II.

A landscape record of the considerable loss of life during World War II is also a characteristic of many other nations. In Russia, for example, there are commemorative monuments in most major cities and towns. One of the most imposing is the *Defenders of Leningrad Monument* in St Petersburg; some 8km south of the city centre this is a reminder of the 500,000 people who died during the siege of St Petersburg by German forces between 1941 and 1944. Many are buried in the Piskaryovka Cemetery to the northeast of the city. The Iran – Iraq war of 1980 -1988, a conflict considered to have incurred as many as 1.5 million casualties, has inevitably bequeathed a legacy in the form of extensive war graves. Some of the reported 600,000 Iranian war dead are interred in the The Martyrs' Cemetery in Tehran, the Golestan-é Shohada (the Rose garden of Martyrs) in Ishfahan, and the cemetery of the Boy Soldiers in Hamadan. No doubt there are equivalent commemorative cemeteries in Iraq.

Other monuments to war include peace parks and museums of war. In Japan reminders of World War II are evident in the urban land use of Hiroshima and Nagasaki. Here the devastation caused by the A bombs dropped in 1945 is remembered in many ways, including peace parks in both cities. In Hiroshima the peace park was created in 1949 and

there are 10 additional reminders, including the Monument of Hiroshima which marks the site where thousands of bodies were collected, and the Children's Peace Monument which was constructed in 1958 in recognition of the children who perished in the aftermath of the bomb. In Nagasaki there is an Atomic Bomb Museum and a Hypocenter Park marking the site of bomb impact, as well as a peace park. Museums of war are also present in Seoul, South Korea, and in Phnom Penh in Cambodia, and in many European countries there are museums and memorials to the holocaust of World War II. The War Museum in Seoul attests to the significant role of war in Korea's history, which in turn, reflects the Korean peninsula's location between China to the west and Japan to the east. This museum occupies substantial grounds in central Seoul and its records go back to the fourth century AD; exhibits range from early wooden warships to World War II aircraft.

In Phnom Penh there is the Tuol Sleng Holocaust Museum, which records the slaughter, indeed the genocide that occurred in Cambodia during the regime of Pol Pot and the Khmer Rouge, especially during the period 1975 to 1979. As many as 1.5 million people were killed as the regime attempted to establish a new nation based on an ideology that embraced a return to a basic life style with emphasis on traditional agriculture, bartering and a rural existence. The poignancy of Tuol Sleng is intensified by the fact that it was originally a high school which was transformed from a centre of learning to one of detention and torture, notably to Security Prison 21 (S-21). Its exhibits are at once gruesome, bleak and heart breaking; they reflect human inhumanity to humans, the so-called 'killing fields' of Indochina. In Europe, the brutality of World War II is recorded in the many concentration camps that sent millions of Jews, gypsies and Slavs to their deaths and which today are preserved as museums (see reference above to Bergen-Belsen and Auschwitz).

Envoi

War and terrorism have left an extensive legacy on landscapes throughout the world. The environmental repercussions of war and terrorism are varied, including bomb damage, altered urban and rural environments, depleted forests and wildlife, cemeteries, museums and memorials. Despite their poignancy, the destruction of conflict continues today as wars rage in dozens of countries and as the world attempts to combat the ever-growing threat of terrorism. The geography of war and terrorism is extensive and emotive; few environments

or nations are immune to its varied and substantial impact, yet there is no reference work which provides a comprehensive account of this important and provocative subject.

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