



# Britain's harnessing of Thames river from the perspective of peace studies and its enlightenment—research based on the background of great stink in London

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## ABSTRACT

In recent years, novel coronavirus has been rampant all over the world, and environmental pollution has increasingly become an unavoidable problem.

The history of human development seems to be always accompanied by environmental pollution. In 1858, the appearance of the big stink in London reflected the serious pollution of Thames River in the process of industrialization. The pollution of the Thames River has aroused widespread concern of all groups in Britain, and the long road of pollution control in Britain has brought profound historical lessons. However, what future generations need to really learn from it is to get rid of the dilemma of pollution before treatment. This study takes the Thames River as an analogy, positioning human destruction of nature as the intertwined of history, and pushing the debate on environmental science, peace science, and history to a climax in order to reach wise recommendations on environmental protection, which is very necessary on the contemporary stage. While promoting the progress of human civilization, strengthening the protection of the environment may be the best way to break the traditional dilemma.

## 1. Introduction

Human beings, like other organisms living on the earth, are part of the living environment and are bred by the environment. It's just that human beings are smarter than other species. They have mastered some natural laws of the living environment and used them for their own use, but also caused serious damage and development to the natural environment. With the development of modernization, countries all over the world have also intensified the development and utilization of natural resources. To a certain extent, this has accelerated the destruction of human living environment, and new modern epidemics such as SARS and novel coronavirus have also been rampant, seriously threatening the living space of human beings. The longer the virus lives, the more widespread its impact will be. In the face of this complex new situation, it is pertinent therefore to control and treat the epidemic, but these are always a negative response. If human civilization wants to go further, it must have a profound reflection, which requires drawing lessons from similar environmental problems in history to re-examine the relationship between human beings and the environment. In 1858, the summer in

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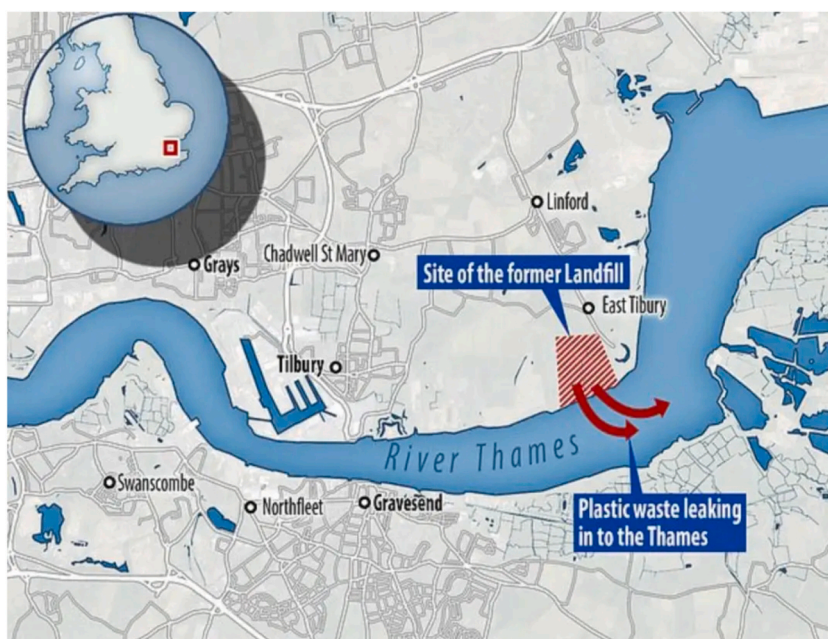


Fig. 1. A map of the Thames River.

London became very hot, and the smell of the polluted Thames River became unbearable, and the whole city of London was filled with unprecedented “great stinch”.

The Thames River is the most important river in Britain. It flows through the British capital London and more than ten cities along the river, and finally flows into the embrace of the North Sea through Noel island. It is the old Thames that nurtured British civilization. Fig. 1 shows a map of the Thames River. The appearance of the great stink in london seriously threatened the health of residents living along the Thames River. At that time, Britain urgently needed to harness the Thames River to solve the imminent problem of survival. What harm does the pollution of the Thames River bring to the British people? How did the British manage the pollution of the Thames River? What lessons and revelations can we get from it to get rid of the dilemma of pollution before treatment? These are issues that need to be discussed in the study.

This manuscript uses the new perspective of peace science to re-examine the whole process from the pollution of the Thames River to its governance, and tries to draw different views through cross-learning courses, which can also put forward new and useful suggestions for environmental governance in the world today.

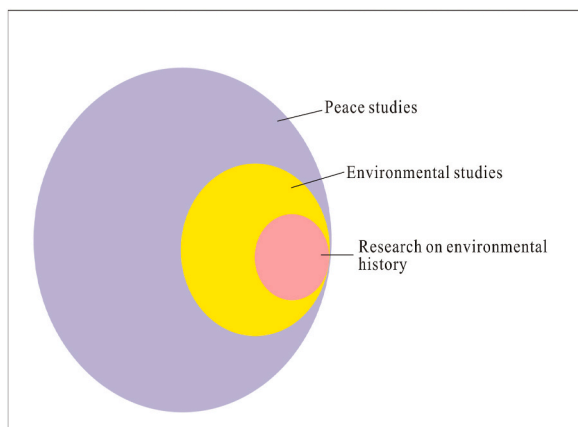
On this basis, this paper mainly adopts the time frame of the Thames case study as a clue. It first combs the harm of Thames River pollution to British public health, then it analyzes the contribution of different people in Britain to the Thames River harness, finally, this paper attempts to analyze the lessons of the Thames River pollution control through the peace study, and draws some useful enlightenment.

## 2. Methods

In 1858, the appearance of London’s great stink showed that the pollution of the Thames River was quite serious, so it caused widespread concern. Many important academic fields, such as social history, public health history, art, literature, environmental science, have discussed this issue, and the relevant academic achievements are also very rich [1,2]. But most of them belong to the research of a single discipline, and the research vision is very limited.

The Hiroshima Peace Declaration on August 6, 1991 clearly pointed out that global environmental pollution had become one of the threats to peace. This means that the problem of environmental pollution has also been classified as one of the research areas of peace science. The research methods and fields of peace science were very extensive, it had the characteristics of interdisciplinary, multi-level and multi-cultural. Peace studies also had both theoretical and practical characteristics. At present, many scholars limit peace research to the category of negative peace, that is, peace only refer to the absence of violence. There was no war and it did not cover social and economic justice [3]. This makes the application of peace science in environmental research extremely limited, and most of them focus on the study of current environmental problems.

In recent years, with the rise of interdisciplinary research, in the process of exploring the Thames River pollution, scholars have gradually integrated environmental science into history, showing a certain perspective of environmental history research. The fourth chapter of the British environmental history since the industrial revolution by B.W. Clapp focused on the water source pollution represented by river pollution and its treatment, which was a masterpiece of environmental history research [4]. As the main research object of this book was the governance of all rivers in Britain, rather than the governance of Thames River, the relevant content of



**Fig. 2.** The relationship between peace science, environmental science and environmental history.



**Fig. 3.** Thames River before the industrial revolution.

Thames River was very limited. Rosemary Ashton's works focussed on the different experiences and practices of Dickens, during the great stink in 1858, Darwin and Disraeli showed the specific impact of the great stink on different people at that time from the same perspective. Judith Flanders praised that this book "shows one of the most important historical writing methods, excavates the things beyond the important time and great people, and finds the connection between seemingly unrelated topics and ideas" [5]. This book was a representative work of micro historiography with rich and colorful contents and fascinating narration. All the above studies focus on the pollution of the Thames River from different aspects and have their own characteristics. The research on the pollution of the Thames River has achieved certain results in the history of environment, but it is a blank in the science of peace, which requires the combination of peace and environmental history to explore this issue.

Therefore, based on the existing research results of environmental history, this paper integrates the theories and methods of peace science again. This paper mainly adopts the interdisciplinary research methods of peace science, environmental science and history. The purposes are to re-examine the history of the serious pollution of the Thames River in 1858 from a broader perspective of peace science, and obtain some different beneficial enlightenment.

Fig. 2 shows the relationship between peace science, environmental science and environmental history. According to Fig. 2, peace studies include both environmental studies and other non-environmental studies related to peace. Environmental science includes both the study of past environmental changes (environmental history) and the study of present environmental changes.

### 3. Findings and discussion

#### 3.1. Hazards caused by pollution of the Thames river

In the 19th century, with the rise of the industrial revolution and the rapid growth of London's population, the Thames River and its tributaries were pushed into a dangerous situation. For a long time, in order to facilitate production and save production costs and



Fig. 4. Thames River with serious pollution after the industrial revolution.

freight, many factories and enterprises have been built on both sides of the river or canal. The industrial wastewater discharged by these factories and enterprises flows back to the river with high temperature, suspended solid particles, acid, alkali or other soluble substances. The water pumped from the mine was more harmful than the river water. The well water often contained trace amounts of arsenic and lead toxic metals, the water also flowed into the river. On the cause of the great stink in 1858, an editorial in the times said: “to a large extent, the stink comes from the garbage dumped into the Thames River” [6]. Industrial growth and the development of sewage systems have turned many rivers into public sewers or disgusting smelly rivers [7]. In addition to industrial production, there was also a large amount of domestic waste. According to statistics, by 1857, about 250 tons of feces were discharged into the Thames River every day [8]. Fig. 3 shows the Thames River before the industrial revolution, and Fig. 4 shows the Thames River with serious pollution after the industrial revolution.

The great stink smell from the polluted Thames River was unbearable for Londoners, the air they breathe was polluted by toxic gases. Queen Victoria and her husband Prince Albert planned to go boating on the Thames River, but a smell from the river soon caught them up with the bank. The stench of the Thames River also made the parliament hall smelly. Even if a thick curtain was covered, a lot of incense was lit, and a lot of perfume was sprayed, it would not help. Members of parliament had to find another place to meet [9]. And the smell lasted for more than a century. What's more, the pumping air from the polluted river water seriously endangered people's health. William morde, a surgeon, investigated 200 people working on and near the Thames River and found that many people had some common symptoms, such as weakness, nausea, pain and blurred eyes, there were also many people who suffered from temporary blindness and visual impairment, and were often insane.

The Thames was the main source of water for Londoners. The continuous pollution of Thames River threatened the drinking water safety of people in London, which led to four major cholera outbreaks [10]. At this time, the British people have linked the Thames River pollution with many diseases, especially the outbreak of infectious diseases. However, the cause and mode of transmission of cholera were still under speculation, investigation and research. In the mid-19th century, William Farr, a British doctor and health statistician, supported the idea that malaria was the cause of cholera [11]. He also proved that the high and low terrain was associated with the low and high cholera mortality rate according to statistical data. After many investigations and experiments, anesthesiologist John Snow concluded that cholera was related to water pollution. But it was not until 1883 that the German bacteriologist Robert Koch discovered the bacterial pathogen of cholera. Snow's theory was generally accepted in Britain [12]. Based on the research of early British scholars, current research has clearly shown that there is a clear relationship between cholera and contaminated water, and domestic water treatment and storage can reduce the occurrence of cholera.

The polluted river water not only produced cholera, but also brought diarrhea and typhoid fever to London residents. From the 1950s to the mid-1960s, it was believed that the pollution of the Thames River and the water from the Thames River played a crucial role in the spread of this infectious disease [13]. From 1840 to 1910 in London, typhoid fever caused the most deaths among water-borne infectious diseases. From 1850 to 1870, an average of four people died of typhoid fever every day in London [14]. Until now, unsafe water still has a serious impact on human health. According to UNESCO 2021 World Water Development Report, about 829,000 people die each year from diarrhea caused by unsafe drinking water, sanitation, and hand hygiene, including nearly 300,000 children under the age of five, representing 5.3% of all deaths in this age group. In addition to disease, unsafe drinking water, and poor environmental hygiene can lead to gastrointestinal illness, inhibiting nutrient absorption and malnutrition. These effects are especially pronounced for children. The spread of various epidemics was also likely to cause major social panic and laid hidden dangers for social unrest. It was reported that during the first outbreak of cholera, there were rumors that the ruling class invented the secret Malthusian weapon to reduce the surplus poor population, which further caused social instability [15]. It was urgent to control the pollution of Thames River.



Fig. 5. Polluted Thames River drinking water cartoon.



Fig. 6. Polluted Thames River drainage pipe cartoon.

### 3.2. Treatment of the Thames river

#### 3.2.1. Awakening of river protection consciousness

British scholars are the most sensitive and responsive to the continuous deterioration of the environment around the Thames River. As early as 1836, before Queen Victoria ascended the throne, someone described the terrible situation of the Thames River, “In this way, the noble river that God has given us for our health, entertainment and interests has become a public sewer in London, every day, a lot of disgusting mixture comes into the water, which is the daily drink of the residents of Europe’s most civilized capital” [16]. In 1849, *Punch*, a famous humorous magazine in British history, published an illustrated poem. The poem was entitled *John’s drinking water*, the poem vividly illustrated the water quality of the Thames in those days. Figs. 5 and 6 are the illustrations of this poem in *Punch*. Edwin Chadwick, secretary of the poverty relief law committee, submitted a report on the health status of the working population in Britain to parliament, which formally aroused the government’s concern about the water situation, under his leadership, the health reform movement focused on proper drainage and sound engineering [17]. This has improved the living conditions of residents in British cities to a certain extent, and also reduced the number of deaths due to infectious diseases. However, due to the huge cost of Chadwick’s dynamic water purification system and the need for multi-sector cooperation, it could not be realized. In addition, the management concept of “centralization” put forward by Chadwick deviated from the British tradition, and the general administration of health established by him was also abolished.

By the 1950s and 1960s, after the industrial revolution, the number of factories had increased sharply, the Thames River was even more polluted. On July 7, 1855, the chemist Michael Faraday wrote to the editor of the *Times*, describing the Thames River he had seen. From 1:30 to 2:00 that afternoon, Faraday took a ship to inspect the river from London to Hangerford Bridges in the lower reaches of

the Thames River. The appearance and smell of the river immediately attracted his attention. He wrote in his letter, “the whole river has turned into a dark light brown liquid with a very smelly smell. At this time, the whole river is actually a sewer” [18]. It was not until 1858 that the stench began to attract the attention of government members, they formed a committee to investigate the pollution of the river. After the investigation, the members of the committee pointed out that the main factors causing river water pollution were domestic sewage, industrial wastewater and solid waste [19]. The British government began to regulate the Thames River.

The “great stink” in London has attracted the attention of the government to the treatment of the Thames River, it also attracted the attention of more British scholars. Henry Mayhew, a British sociologist, described in his work “London workers and the poor in London”, “we use the water of the Thames River to cook vegetables, stew meat, brew coffee and make tea. We throw the viscera of our livestock into the river again and again, and this water returns to our mouths and is drunk by us. We import seabird dung and drink the solution made from our own dung. This is a kind of fertilizer that can make it more valuable than foreign seabird dung” [20]. Victorian English writers also linked filth, disease and moral corruption. The novelist Charles Dickens once wrote in our common friend, “here, the dregs accumulated by human beings seem to be washed down from high places. Like many moral sewage, it stays here until its own weight presses it to the bank and sinks into the river. In 1851, he appealed to the London Municipal Health Council, “health reform must precede all other social remedies” [21].

At the same time, Darwin’s origin of species (1859) was published, which laid the foundation of British scientific thought and pushed the power of nature to a new height to arouse people’s awe of nature. These writers and artists regarded the environmental crisis represented by the great stink as a manifestation of the religious moral crisis, and then extended environmental anxiety to moral anxiety. They expected to arouse people’s moral conscience and paid attention to environmental pollution through this way. The pollution of Thames River has finally received more attention from officials and upper class people.

### 3.2.2. Establishment and legislative activities of the pollution control committee

The serious harm of Thames River pollution finally attracted the great attention of the British government. On May 18, 1865, the government appointed the first river pollution committee to investigate the pollution of rivers in Britain. During the investigation, they paid great attention to listening to the suggestions of local residents. However, there were serious differences in the views of the committee members. Rorison publicly announced that he did not want to continue to cooperate with Harrison, again [22].

On April 6, 1868, the British government appointed the second river pollution committee. The members continued the way of the first river pollution committee. After careful analysis and investigation according to the local actual situation, they found that a local regime lacking control could never effectively solve the problem of river pollution. Therefore, they proposed that it was necessary to establish a unified central organization to supervise and manage rivers. In this way, they could better coordinate and take corresponding measures. In addition, the cost of river pollution control should be borne by the collective or individual causing the pollution [23]. The reports of the two river pollution committees provided the British government with a lot of necessary and detailed information for the control of river pollution, which provided sufficient preparation for the control work.

From the perspective of parliament, since some measures provided by the customary law to prevent river pollution failed to have any obvious effect, parliament adopted legislative means to deal with water pollution [24]. In 1855, parliament enacted the nuisance removed act, which tried to impose fines on manufacturers who polluted rivers with industrial wastewater. However, due to various obstacles, it has not been implemented. The public health in Britain has been seriously threatened after the stink. After investigation, the Privy Council believed that the number of deaths from diarrhea was closely related to air pollution or water pollution, which strengthened the attention of the parliament and all sectors of society to the problem of river pollution. In 1865 and 1868, the parliament appointed the Royal Commission twice to investigate the pollution of British rivers and seek the best way to prevent and control river pollution. However, in the face of river pollution control, there were fierce debates among interest groups, local governments and political parties, and no substantive progress could be made in the short term.

It was not until 1875 that the parliament finally passed the public health act, which clearly stipulated that local relevant agencies should timely repair the sewers within their jurisdiction. When necessary, more sewers were built to discharge local sewage [25]. The act put public health under the supervision of the state, creating a precedent for the central government to intervene in local areas to solve urban governance problems. At the same time, central and local health committees were established to be responsible for water supply, sewage discharge and street cleaning. From 1848 to 1854, a total of 182 local health committees were established throughout the country. In the following 25 years, hundreds of local health committees were established [26].

On this basis, the parliament passed the rivers pollution prevention act of 1876. The law clearly stipulated that it was illegal for anyone to discharge any solid or liquid sewage into a river. It was illegal for any factory, manufacturing industry or mine to discharge toxic, harmful or polluting solids and liquids into rivers. The act also stipulated that the trial of river pollution cases was conducted by the village court, and the judge had the power to order that any act of polluting the river was prohibited, otherwise the offender should be fined £ 50 per day until the offender obeyed the order of the judge, if a party had any objection to the trial of the village court, he could appeal to a higher court [27]. From the content point of view, the law has defined the boundaries of violation of laws and clarified the terms of reference of various departments. Some people believe that this bill can improve people’s living environment and improve people’s health level. It is a highly feasible bill [28]. However, the bill has made various restrictions on the prosecution conditions of industrial and mining enterprises that produce river pollution, and there are still big loopholes, which has been denounced as a failed legislation. For the river pollution prevention and control act of 1876, there was a lot of evidence that the government just drafted a framework and then asked commercial interest groups to fill in the details [29]. Such pollution control standards were highly subjective and fuzzy, so it was difficult to control the continuous flow of pollutants into the Thames River or other rivers. Table 1 summarizes the institutions, years, organizations, laws and tasks for pollution control of Thames River.

Table 1 explain that the legislation on rivers is increasing year by year, and the regulations are becoming more and more strict,

**Table 1**

Summarizes the institutions, years, organizations, laws and tasks for pollution control of Thames River.

Mechanism	Particular year	Organization	Law	Task
government	1865	the first River Pollution Committee	-	investigation and research
government	1868	the second River Pollution Committee	-	investigation and research
parliament	1855	-	Nuisance Removed Act	legislation
parliament	1865	the first Royal Commission	-	find a way
parliament	1868	the second Royal Commission	-	find a way
parliament	1875	-	Public Health Act	legal intervention
parliament	1876	-	The Rivers Pollution Prevention Act	feasible law

No matter how this law is evaluated, it has taken the first step in river protection. It is not only the first national legislation to prevent river pollution in British history, but also the first water environment protection regulation in world history. Until 1951, it was the basic law on river pollution in Britain [30].

**Table 2**

Summarizes Thames River facilities, completion time, embankment length, cost and modern role.

Facilities	Completion time	Length/km	Cost/10000 pounds	Modern role
river embankment	1864	4.8	250	London line of defense
metro	1874	-	-	the first subway network
sewer pipe	1875	133	460	foundation of sewer system

which shows that the British government attaches great importance to river governance.

### 3.2.3. Construction of dams and sewers

Legislation is only one aspect of river regulation, if people want to improve the ecological environment of Thames River, people must start from the technical approach. Thames River is the main water source for Londoners, the drain outlet of the sewer must not be close to the intake of domestic water for residents, and must be set elsewhere. After the industrial revolution, local governments have also been fully aware of the consequences of waste discharged into rivers through sewers, and began to actively explore the London sewer reform and construction model [31]. The chancellor of the exchequer Benjamin Disraeli introduced a bill. This bill authorized the Metropolitan Board of works to intercept sewage pipes to prevent London sewage from flowing into the Thames River [32]. This proposal has been unanimously approved by the parliament and has received financial support. Then Joseph Bazalgette, chief engineer of the London municipal engineering committee, immediately started an extensive network of pipelines and pumping stations, the project was completed in 1875. A total of 133 km of new cross sewers were built, covering the whole city, including 450 miles (720 km) of main roads. The pipeline connected about 13000 miles of branch roads at a cost of £ 4.6 million [33]. To this day, this pipe is still the foundation of London's sewer system. Although huge human and material resources and a long time were spent in the end, the intercepting sewer was built to safely transport the increasing wastewater in London. This project has also eased the traffic congestion in strand street, accommodated the new subway network and beautified the surface landscape. This project has effectively promoted the modernization of London.

The Thames River is a tidal river. The sewers on the north bank are lower than the water level of the river. When the tide rises, it will cause garbage accumulation and breed diseases. For this reason, in the 1830s, the painter John Martin proposed to combine the two projects of river embankment construction and sewer laying, which was soon approved and supported by the relevant British departments. After taking over this work, the engineer Bazerjit opened up about 37 acres of land at the sewage siltation on the north bank, and began to build the Thames River embankment in 1864, there were three main sections of river embankment, including victoria embankment, chelsea embankment on the north bank and albert embankment on the south bank. These three sections of river embankment were 3 miles in total. The embankment was completed in may1874 at a total cost of 2.5 million pounds [34]. In 1864, a subway was built under heti, forming part of the world's first subway network [35]. The Thames dam not only provided a channel for low-level intercepting sewers, but also protected the last line of defense in London. In addition to the construction of the Thames River, there was also a large amount of money for the construction or beautification of parks, gardens, bridges and streets [36]. It has become a green space for Londoners' leisure and entertainment. Table 2 shows Thames River facilities, completion time, embankment length, cost and modern role.

Table 2 proved that in 1864, the construction of the Thames embankment led to the development of two other projects, which significantly improved the water environment of London residents and also provided convenience for residents to travel.

After the completion of the construction of the London sewer pipeline and the Thames dam, the London News illustrated compared the old and new look of London, and praised, "the project of the London municipal engineering committee is large-scale, with the construction of the main sewer project and the Thames River dam, which has greatly improved public health and made the metropolis more convenient and magnificent" [37].

### 3.3. Enlightenment of peace science

The pollution of Thames River was mainly a by-product of the industrial revolution and socialized production. In the second half of

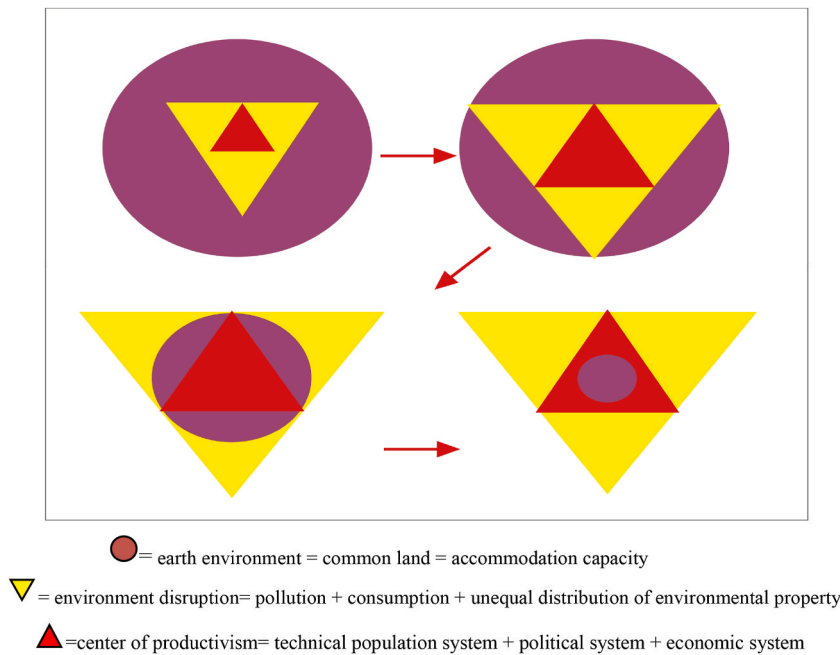


Fig. 7. Structure and changes of environmental damage system.

the 19th century, Britain gradually began to take measures to harness the Thames River. In general, the British government, individuals and social organizations have made certain efforts to control the Thames River pollution. However, for a long time since the 19th century, the effect of the British in controlling the pollution of the Thames River was not obvious, and the general trend of pollution deterioration was not controlled. Therefore, some scholars concluded, “the treatment of river pollution must be regarded as the most unsatisfactory chapter in the history of public health in the Victorian era” [38]. There were many reasons for this result. In the Victorian period, political power was dispersed, liberalism was allowed to prevail economically, the level of river pollution control technology was low, and the application of technology was not in place, so the treatment effect was not obvious. It was not until the 1960s that the Thames River was effectively controlled. The experience of the British government in governing the Thames River was not an example to be learned, but a lesson to be learned. With the progress of science and technology and the improvement of political system, modern countries have been able to effectively control and treat river pollution, which is the progress of human civilization. However, with the emergence of new forms of river pollution, similar pollution methods are more hidden, more difficult to control, and more lasting damage to human groups. Therefore, what people really learn from London stink is not the experience of how to control river pollution, but how to stop the similar phenomenon of London stink, and how to develop the economy without polluting the environment, so as to get rid of the dilemma of environmental pollution first and then environmental governance.

### 3.3.1. From the relationship of opposites to the relationship of harmonious coexistence

The pollution of Thames River reflects the deterioration of the relationship between man, nature and economy in Britain for a long time, and also reflects the arrogance, ignorance and selfishness of people at that time under the development of science and technology. In the process of pollution control, the anti pollution efforts made by some associations have been ridiculed by people who are critical of pollution measures. Opponents believe that profits and jobs should not be sacrificed for the entertainment of the privileged, such as fishing [39]. With the development of science and technology and the improvement of human ability to transform nature, human beings seem to be more arrogant and selfish than before. In the short history of modernization of more than 100 years, there have been several scenes similar to the stench of London, which are unprecedented in scale, scope, duration and complexity. The protection of water sources and even other natural resources has become insignificant. In the wave of modern economic development. It seems that human beings must sacrifice the environment to develop the economy. An important source of the problem is that human beings have never correctly recognized the correct relationship between man and nature, and simply opposed man and nature.

Fig. 7 shows structure and changes of environmental damage system.

When the production-centered (equilateral triangle) advocated by economics is dominant, the environmental damage (inverted triangle) is more serious, and the earth environment (round) is worse, as shown in Fig. 7.

Peace science advocates the unification of positive peace and negative peace. And natural peace is one of the contents of positive peace [40]. In the field of natural peace, peace means eliminating the threat of global environmental pollution to peace, and it means creating a social environment in which people can live a rich and decent life [41]. It can be seen that human economic development activities and the environment are harmonious and unified. That is, in economic activities, man and nature should not be a life and death struggle, but a harmonious symbiosis between them. Poetic dwelling is a new way of life and ideal realm conceived by Heidegger



for mankind. The basic feature of habitation is protection, that means, he is not only concerned about human existence, but also about the overall human attitude towards the existence. He advocates that people should protect and take care of the existence, and let people release their own essence, and gather as a whole in a friendly and peaceful world [42]. This may be the right relationship between man and nature.

Nature has bred this highly intelligent species of human beings in the process of continuous change, which does not lead human beings to self destruction. Nature is an environment that hopes mankind can better protect the important nourishment needed by the development of human civilization. In this way, human civilization will be more long-term and brilliant. In the process of modernization, human beings' excessive exploitation and demand for nature will not lead to the destruction of nature, because nature has its own purification system, which will regularly and automatically discharge the big toxins from the body, and it is only human beings who will be destroyed at that time. In the face of nature, man should neither belittle himself nor be arrogant. The unique wisdom endowed by nature can not only be used to improve their own lives, but also can be used in environmental protection.

### 3.3.2. *Develop peace education to awaken the general public's sense of environmental responsibility*

In the process of harnessing the Thames River, it not only attracted the attention of British politicians and scientists, but also stimulated the sense of responsibility of artists and writers. However, for ordinary people in the Victorian era, the actual impact of a polluted river on health was not recognized by the public in the mid-1970s [43]. In the face of polluted rivers, although some people or organizations complained before the Royal Commission at that time, most of the public accepted the current situation of pollution. More seriously, when the Royal Commission proposed measures that could prevent river pollution without harming trade and health, the public was ignorant or indifferent. Because river protection needs to pay a certain economic cost, it has become a less urgent luxury for ordinary people in the Victorian era, who cannot solve the problem of food and clothing. In other words, the people at that time were unable to protect the river. However, with the development of economy, when ordinary people have the ability to protect rivers, they have also been used to completely entrust the responsibility of protecting rivers and other natural resources to important people, but they stay out of it.

Peace is a non violent way to deal with conflicts, which contains the connotation of equality and justice. Equality and fairness are the most cherished values of peace studies[44]. They not only mean rights but also responsibilities and obligations, which is particularly important in river protection and environmental protection. Senior politicians, scientists and other important figures have the advantage of social resources. Although they can play an important leading role in society, they only account for a small number. They have their own scope of activities and discourse system, which may not be understood and accepted by ordinary people. However, ordinary people have an absolute advantage in quantity and are the main body of interactive relationship with the environment, their clothing, food, housing and transportation are closely related to the environment. If ordinary people think they have no obligation to protect natural resources such as rivers, environmental protection will also be out of the question. If we want a large number of ordinary people to assume their due responsibility for environmental protection, the way of peace education is one of the important ways we can take.

Galtung, the father of peace studies, defined education as an important means to achieve peace, and clarified the relationship between education and the construction of peace and the resolution of conflicts[45]. Although there are different interpretations of peace education, its basic definition can be understood as education on Non Violence, conflict resolution, economic balance, political participation and environmental awareness, which is education for peace and social justice[46]. Peace education is conducive to promoting the development of individual planet consciousness. It makes us realize that we are a global citizen, and then improves the existing social structure and thinking mode. This way can change the ideal of human living conditions[47]. Obviously, peace education is an important way to cultivate the awareness of paying attention to human living environment, and also an important way to cultivate ordinary people to bear the awareness of environmental protection.

### 3.3.3. *Achieve win-win cooperation and jointly build a security barrier*

In fact, the most serious pollution to the Thames River is the British local authorities. The way of treatment is to inject it into the river, because it saves time, labor and money. Local governments often enjoy great autonomy and can almost always influence local decisions, they naturally opposed the idea of sending inspectors from a certain department of the central government, believing that these people might harass them. The Royal Commission made a proposal to hand over a polluted watershed to a single authority, which is often not supported by local management advocates[48]. Although the stench of London has aroused widespread concern among the upper class of British society, within the upper class of society, there are only separate policies. For example, Although the power of the General Administration of health is guaranteed by law, its policies are difficult to implement locally. Most of the time, the authority of the General Administration of health is more directive than mandatory [49]. And once parliament shows a little interest in implementing measures to prevent river pollution, there will be opposition voices such as loss of trade and loss of jobs [50]. All this is not difficult to see that in the process of governance of the Thames River, there is an obvious separation of ownership and jurisdiction, and each department within the jurisdiction acts independently. The governance of the river has intensified the contradictions and conflicts between different interest groups in Britain to a certain extent, thus hindering the purification of the Thames.

In peace studies, there are four modes of dealing with conflicts. Among them, only the problem-solving mode, that is, attaching importance to the interests of both sides, is more conducive to resolving conflicts[51]. Problem solving can be divided into three forms, compromise, selectivity and integration, among them, integration is the best form[52]. Modern society is a period of economic globalization, and economies and ecosystems are also woven into an inseparable network of regional, national and global causality [53]. This means that the problem of environmental pollution has also broken through the restrictions of a country or region, and the protection and governance of the environment has also been expanded to the global scope. In the old social structure, developed

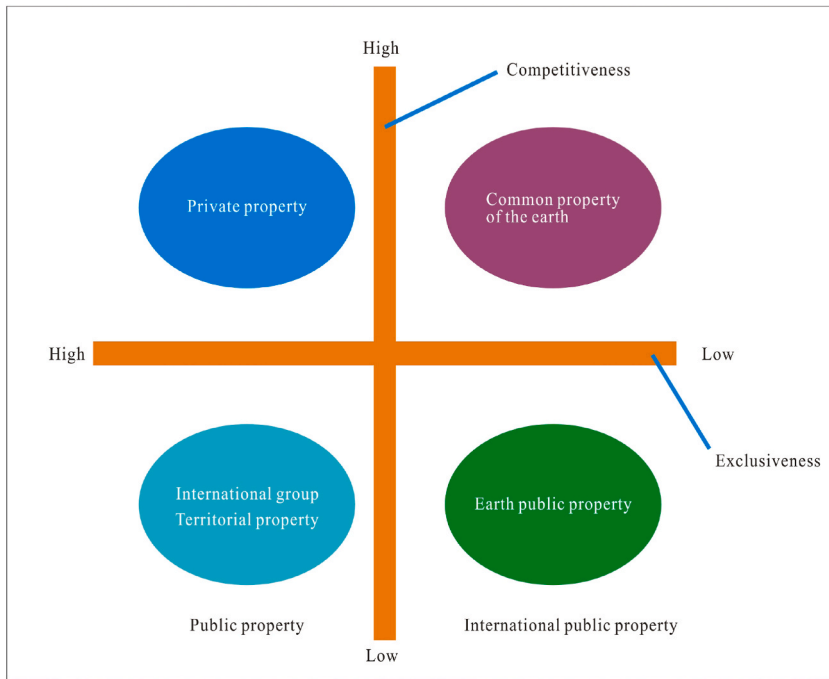


Fig. 8. Property structure of world society.

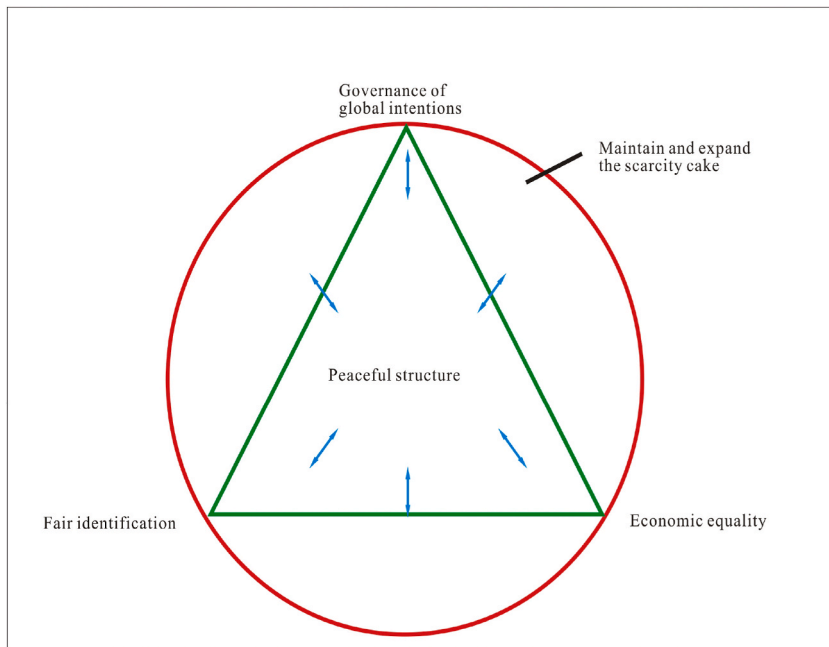


Fig. 9. Peace structure.

countries and large countries play a leading role in solving environmental problems, and they tend to formulate policies led by developed countries. This policy is at the expense of the interests of small and developing countries, which has accelerated the plundering of public resources and the destruction of the public environment.

According to the theory of peace science integration, the interests of all countries in the world are consistent in environmental protection and governance, countries should move towards integration and create new social structures. In this way, all parties can be treated fairly. Thus, the asymmetric game relationship between countries is built into a coexistence relationship between countries

around environmental problems. The game relationship between countries has become a win-win relationship. Finally, a non competitive and non exclusive development environment will be formed. This can also reduce the further plundering and destruction of the environment, and strengthen the protection of the environment. The countries of the world are closely linked interests, as shown in Fig. 8. When the competitiveness and exclusivity are higher, the more prominent is private property. On the contrary, when the competitiveness and exclusivity are lower, the more prominent is the earth public property related to countries.

In short, the ways of peace science to solve the problem of environmental pollution are shown in Fig. 9. The economic equality achieved under the harmonious coexistence of human and nature, fair identification achieved under peace education, maximization of interests achieved on the basis of equal cooperation among governments of all countries. When these three conditions are met at the same time, it is most likely to be most beneficial to the overall development of mankind.

#### 4. Conclusions

Thames River has experienced the whole process from pollution to treatment, which is a long process, the British people have also paid a heavy price for this. Peace studies brings us new enlightenment from different perspectives. What we get from it is not the experience of how to manage rivers, but how to break the dilemma of pollution before treatment. This needs to arouse the awareness of environmental protection and participation of the general public, and adjust the relationship between man and nature, man and man, as well as country and country from the old hostile and competitive relationship to a new type of symbiotic and cooperative relationship. Because this article is an attempt to combine the study of peace, environment and history, there are still some shortcomings. This paper mainly focuses on the citation of historical data, the use of empirical methods, and the connection between historical practice and reality need to be strengthened. The environmental protection policy suggestions put forward in this paper may also be a part of it. I hope they can play a role in the future research of the combination of peace science and environmental history. Although mankind has a long way to go in environmental protection in the future, the United Nations Climate Change Conference held in Sharm el-Sheikh (Egypt) in 2022 has established carbon reduction as the theme of environmental protection. Human beings have already begun to prove the importance of breaking the rule of “pollution before treatment” in action.

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#### Declaration of competing interest

The authors declare no conflict of interest.

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