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*Research article*

# Sustainable tourism: a valid remedy against climate change impact in every context. The Svalbard and Kiribati archipelagos

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**Abstract:** Climate change, with relevant global warming, has a deep and global impact on environment but the consequences on local populations and respective economic activity may differ in a significant way depending on the dissimilar socio-economic conditions.

This study compares the conspicuous effect that this change of natural conditions has on two archipelagos placed in extreme latitudes. Regardless of latitude, the impact on the environment is important, conditioning significantly the landscape and the usual natural life of animals and human being. The possibility to cope with those consequences are dramatically limited for the underdeveloped population of Kiribati. Due to its coral nature this archipelago risks to be flooded and disappear with few meters of increase in sea level together with the very basic activities that the population has adopted as a mean of subsistence (fishing and agriculture). Because of this situation, the Kiribati population is seriously facing the disappearing of his Country together with his cultural identity and is considering the mass exodus in other safer areas to survive. The wealthier population of Svalbard has the possibility to defend themselves and their archipelago with the substantial help of the international community but, at the same time, they risk having their historical landscape and culture deeply influenced by the economic interests that the warmer climate can offer.

For both populations the sustainable tourism has been in the last period an alternative activity to traditional economy. This study proposes to adopt the sustainable tourism as a valid instrument to help local populations defending themselves, their culture, and their country against the disruptive effects of climate changes.

**Keywords**: climate change; environmental risk; sustainable tourism; protection; development; Kiribati; Svalbard

## 1. Introduction

This research is part of the environmental geography studies with reference to the negative influence of climate alteration in the archipelagic area. The consequences of climate change often lead to changes in the most characteristic aspects of a territory and sometimes tend to influence precisely the peculiarities that made those places famous, appreciated and unique. This happens when a few tens of centimetres of variation in the average sea level or when some degrees of the average temperature affect the lagoon or coral ecosystems or areas of excellence for agricultural or zootechnical production or for fishing. The populations of these places with unique characteristics and international fame over time have understood the value of the resource of the territory and have learned to love it and use it to respect its delicate balances, developing specific sensitivity and skills. The greater the cultural and economic dependence of these populations on their ecosystem, the greater the damage they receive due to its significant transformations. If this happens in areas of the planet with a low level of development, the effect is even more devastating since populations often have a very limited vision of the causes of the change they are experiencing and of the concrete possibilities of remedying and, in most cases, they only try to reduce or delay the effects, almost always very heavy, on their context and, consequently, on their identity.

This study, adopting a methodology based on official statistics on movement of tourists, on local press articles and on international organisations discussions/resolutions about the matter, aims to verify if the adoption of sustainable tourism as a main economic activity, could also help populations protecting their historical identity endangered by the effect of climate changes even if in different contexts or following their exodus to alternative remote locations.

In this study I compare the consequences that this change of natural conditions has on two archipelagos placed in extreme latitudes: polar and equatorial. In both environments the changes are important, conditioning significantly the landscape and the usual natural life of animals and human being.

The choice of analysing two archipelagos placed in very different geographic latitudes, as Svalbard and Kiribati, has the scope to confirm that the climate changes are a global serious problem with dissimilar consequences in different areas, therefore it is essential to consider the characteristics of each area with the purpose of limit the specific impacts of the climate modification and also to identify the best way to achieve a sustainable development.

The hypothesis connected to the research theme is that sustainability represents a prerequisite for the conservation not only of the habitat of all those contexts characterized by delicate balances, but also of the cultural identity and the memory of populations which, seeing their contexts gradually disappear of life, would also witness the progressive disappearance of the collective memory and its identity heritage. In particular, it is believed that this research can offer a contribution to the literature on the theme of tourism sustainability in small islands because it adopts an analysis methodology based on the comparison of two radically different contexts, located at extreme latitudes, which in presence of a radical upheaval of their territorial structures, of their life habits, of their economy,

even if whit different way to react, they keep the same objective of preserving their territorial identity also thanks to sustainable tourism. Furthermore, sustainable tourism has the undoubted advantage of attracting a clientele belonging to a group of public opinion that is particularly sensitive to landscape and naturalistic specificities and which therefore constitutes a powerful international sounding board for requests for attention to the environment of the populations affected by the effects of climate change.

Investing in the development of sustainable tourism therefore represents in the case of Svalbard, the best habitat defence strategy, the main resource of the territory and, in the case of Kiribati, the only way to guarantee the survival of the collective memory itself. To date, in fact, in both contexts, local populations have only tried to stem the effects of climate change, despite being aware of the upheavals that it causes today and will bring in the future. In the case of the Svalbard archipelago, as will be seen, the effects of climate change, if on the one hand they are profoundly altering the landscape, on the other they are opening the way to an alternative exploitation of the territory. Belonging to a political/economic context of a certain importance and the strategic geographical position, have attracted the interest of the main world logistics operators who think about the construction of hub ports, promising easy economic benefits for local populations. In this reality, the use of sustainable tourism represents a valid opportunity for the livelihood of populations who, by investing appropriately in this sector, can increase their autonomy, making themselves less sensitive to the enticements of the globalized market and being able to decide more clearly about their future. In the case of Kiribati, however, whose survival itself appears irreparably compromised due to the devastating effects of climate change on the territory, the adoption of sustainable tourism, based on the respect and protection of indigenous resources, becomes the only possibility to preserve the local cultural identity, even in the event of a probable mass exodus.

The aim of this work is therefore to demonstrate that this good practice allows and will allow these populations, whose habitat is destined to undergo profound alterations or disappear, to defend it at best or to reposition itself in other areas (the Kiribati populations have already they are moving to the coasts of New Zealand or to other nearby archipelagos such as the Fiji islands) in which they can transfer all their baggage of culture and traditions, preserved today thanks to the practice of sustainable tourism. It is therefore believed that the innovative aspect of this study lies in the consideration that sustainable tourism represents an instrument for the protection of the culture of the populations more closely linked to the specific characteristics of their territory even where there should be a factual disappearance of the same and therefore if they should be forced to reposition yourself and rebuild their lives from these resources.

The objective of the research is therefore connected with the theme of sustainability, on which the debate will focus on in the first part of this analysis. Secondly we will analyse the natural resources of each area, then the main impacts related with global warming on both natural and human life, finally the perspectives of development or involution, depending on the level of economic growth and international influence of each Country.

The insular nature of these areas has always favoured economic activities linked to the sea: in the past essentially fishing and today, increasingly, the tourism, very often due to the interest for the “wild”, with his unique sublime charm, that a place can offer for visitors with interests of niche. The climate changes, with consequent alterations of the environmental or landscape resources on which this activity is based, represents a serious risk to compromise it or even to make it to disappear.

In particular, in the case of Svalbard islands, the alteration of the environment, the main attractive justification for tourism, could cause the crisis for this sector, maybe with other "side effects" that could help the development of new activities that, due to the level of structural investment required, may be out of the control of the local populations that seriously risk to see their territory exploited in a devastating way with marginal economic benefits for the insiders and, once the economic reasons that justified the aforesaid infrastructural investments change, to see themselves abandoned in a profoundly transformed and impoverished environment. In the case of Kiribati archipelago, the risk is not only for the subsistence of the tourist activity but also for the whole Country [1].

The population of Svalbard, part of the Norwegian kingdom, has the possibility to defend themselves and the economy of their archipelago with the important help of the worldwide public opinion but, on the other side of the coin there is a risk that the interest to preserve their polar landscape and historical culture could be passed over by the economic interests that a de-iced place can offer in the 'Polar Silk Road' strategy. The possibility to cope with the consequences of global warming are dramatically limited for the extremely poor population of Kiribati, a remote and almost unknown small Country. Due to its coral nature this archipelago risks to be flooded and disappear under waters with few meters of increase in sea level together with the very basic activities that the population has in the last centuries adopted as a mean of subsistence (fishing and agriculture). Because of this situation, the Kiribati population is seriously facing the disappearing of his Country and cultural identity and is considering the total exodus in other safer areas to survive.

For both populations the sustainable tourism has been in the last period an activity that represented a good alternative to traditional economy and could represent now an appropriate way to keep their historical identity despite the deep effects of climate change. This research shows that the adoption of sustainable tourism could be, more than a good economic possibility only, a wise strategy to increase the consciousness of visitors and local population about the risk that the effect of climate changes can constitute for their traditional environment and consequently for the local historical culture that is a valuable heritage to be preserved even if the only alternative left in consequence of the environmental collapse is the exodus to alternative remote locations.

## 2. Sustainability and sustainable tourism

The close connection between this study and the theme of sustainability leads us first of all to some reflections on the evolution of the concept of "development" and in particular on the relationship between the concept of sustainable development and those of development as growth.

The latter concept has dominated for a long time in the economic and political fields, as well as that of *human development* adopted in the last decade of the last century by the United Nations Development Program [2].

The development theories that emerged at the turn of the middle of the last century rested on four objectives: full employment, expansion of the gross national product, growth of individual income, removal of underdeveloped areas. It was assumed that public investment, if made under appropriate market conditions, would be able to activate an income multiplier that would have, in turn, fuel an employment multiplier. In this way, however, some variables were excluded from the development equation which, starting from the seventies, would have assumed considerable importance, such as those concerning the quality of life, the natural environment, the criteria for

managing natural and cultural resources. In essence, the policy focused solely on savings, investments, consumption, employment and income. So, most of the land use transformations that occurred from the end of the Second World War to the 1970s, as well as most of the environmental implications, were legitimized by a theory that identified economic development in growth and referred it to a limited number of variables.

At the beginning of the seventies, this political framework, in which the neo-industrial society developed, was subjected to refutation for the emergence of two interconnected tendencies of thought: the relevance of the environmental variable in economic policies and the need to place limits on the use of natural resources [3]. In 1972, during the United Nations Conference on the Human Environment, environmental policy began to be applied to the various reference levels: global, large-scale and national. The environment was introduced into the development equations.

In the same year, during the Conference on the Limits to Development held in Rome, was stressed that the exponential growth in the demand for natural resources was not sustainable in the presence of a finite system of resources such as that of planet Earth. The increase in consumption would have provoked phases of crisis due to levels of demand exceeding the supply of sustainable resources from the ecosystem. To avoid this, economic policies should have taken the natural limits of development as a constraint, abandoning the idea of rapid and unlimited growth. On the other hand, the growth opportunities would not have been conditioned only by the limited natural resources, but also by the expansion of urban and industrial spaces to the detriment of forest and agricultural ones. So it was that the debate on the limits of development also aroused reflections on the very idea of development. They came to the conclusion that between *growth* and *development* there is a substantial difference: *growth* consists in a dimensional increase of an organism or structure caused by the addition of material through assimilation and accumulation, while *development* consists in expanding or realizing potential, in order to gradually reach a better, physiologically wider condition [4]. The development therefore implies the improvement of the quality while the same does not happen for the growth which can also be associated with a negative overload. The novelty of the approach also consisted of considering the environment an internality of the economic system. It was recognized a value that concern both society and nature of admitting the right of all members of the community to express their potential, always maintaining the basic objective of guaranteeing the integrity of the ecosystem. These positions took shape through the development of two concepts, that of *human development* and that of *sustainable development*. While the United Nations attempted to broaden the spectrum of economic policy objectives to include environmental protection, the action of the *Group of 77*, which was formed in 1964 and brought together representatives of developing countries, gained strength within them. By gathering enough votes to influence the assembly towards the problems of the developing world, the Group managed to stimulate greater sensitivity towards issues such as a lack of quality of life and violation of human rights, so as to induce to elaborate within the United Nations Development Program the concept of *human development*, to be identified not only in the growth of macroeconomic variables, but to be extended to the quality of life and political freedom.

In this way, in the early eighties, the concept of *sustainable development* was born, through agreements of principle, implemented within the framework of the Man and Biosphere program (UNESCO). With the subsequent United Nations resolution of 1989, the results of the work of the World Commission on the Environment and Development were accepted and it was decided to convene an international conference to systematically develop a sustainable development policy.

Therefore, in 1992 with the United Nations Conference on the Environment and Development (UNCED) in Rio de Janeiro, this elaboration phase ended with a declaration of principles, two conventions—on climate change and biodiversity—and the Agenda 21. From the documents approved during the conference, sustainable development appears as a system of objectives consisting of: respect for the integrity of the ecosystem, research for sustainable development—through maximizing the use of renewable resources and minimizing the use of non-renewable resources, the guarantee of social justice, including the protection of the rights of future generations [2]. In 2002, the official follow-up to the Rio Conference was organized in South Africa and, in 2012, the Brazilian capital was chosen by the United Nations as the location for the Conference on sustainable development, with the aim of renewing the commitment to sustainable development. through the enhancement of the green economy, identify and evaluate gaps and recognize and face new challenges.

Tourism, as a factor of "environmental pressure" but also a tool for development and promotion, occupies an important place in the debate on sustainability. First of all, it must be considered that the environmental damage caused by uncontrolled and unplanned tourism is not only connected to the spatial concentration of the phenomenon which, as highlighted by some authors, also appears to be correlated to the growth of $CO_2$ emissions into the atmosphere and the consumption of agricultural land [5,6], but also to factors related to the behaviour of tourists in using resources and the way tourism is carried out [7]. Evaluating sustainability and social compatibility will therefore mean placing the emphasis on changing local values and customs which, especially in the case of small islands, are severely stressed by contacts with different models and lifestyles imported by tourists [8,9].

For example, recovering the traditional activities, superseded with the affirmation of the tourist business, could be an excellent method to rediscover values and identity, as well as the sense of the lost place due to a space first visited and then consumed [10] with the cultural standardization on the basis of elements of modernity often in strong contradiction with the aspects of the tradition and values of the local society.

It is a matter of supporting tourism policies that aim at a more careful balance between supply and demand, in a global approach that jointly considers the multiple aspects of tourism development, in order to manage resources according to an environmental sustainability criterion that provides for a use compatible with its protection. This could be considered the trait of union between the objectives of environmental sustainability and sustainable tourism, through a spiral growth model and precise control of the expansion of tourist activity and related activities. An integrated and oriented development that foresees the shared management of resources by all the subjects involved in the process: a "participated" approach with which to achieve a gradual balance between the different territorial entities. In this perspective, the natural environment would be identified with the "sustainable landscape", a new way of representing the tourist space which, as Lemmi points out [7], would be activated by eco-compatible growth scenarios that would finally allow to recover and enhance endogenous cultural models, normally expressed by an original aesthetic sense and absolutely compatible with the functionality of the places and populations that inhabit them. This would allow local communities to reclaim the places and the symbolism in the respect of the aesthetic conception of the landscape.

## 3. The Svalbard archipelago

Located in the Arctic Ocean (74–81°N, 10–34°E), the Svalbard archipelago is part of the Kingdom of Norway, even if without the status of municipality or county, covering a total area of 61,022 $km^2$, corresponding to approximately 16% of the entire territory of the Kingdom of Norway. The main island is Spitsbergen (37,814 $km^2$), which is also where the main settlements are located and where most of the activities take place. Svalbard, with their 2650 inhabitants, is one of the regions with the lowest population density in the world, equal to 0.04 inhabitants per $km^2$ compared to 16 inhabitants per $km^2$ in the continental part of Norway.

The Svalbard territory is also characterized by a geology, unique in Northern Europe, for diversity of formation and number of protected areas:

- Innumerable small and large glaciers cover approximately 60% of the archipelago's land area;
- 7 national parks (out of 44 in Norway as a whole);
- 6 nature reserves;
- 15 bird sanctuaries;
- 1 geological protection area.

In total, 65% of the Svalbard lands are protected by law to keep under control and preserve their unique nature, their landscape and their cultural heritage. Although its geographic position is decidedly peripheral, the archipelago has played a central role in the international geopolitical panorama, thanks mainly to the presence of large mineral resources that have attracted the attention of the richest and most powerful countries, since the XIX century.

One of the most interesting aspects of the territorial history of the Svalbard is represented by its dynamics of settlement, not yet entirely known: the same discovery of the islands is not datable with certainty: the name is present in some Icelandic documents of 1194, in which they called "Svalbard" (literally "cold limit") some emerged lands north of Iceland [11] but, in 1596, were the Dutch to reach the Island of the Bears, the most Southern and Western Archipelago: Spitsbergen. In 1607, Harry Amazon reached the North end of the archipelago, describing the richness of the Arctic fauna.

During the XVIII century, the area was explored by Norwegians, Danes and especially Russians, particularly active in the hunting of whales. It was in the XIX century that the archipelago became famous for the richness of coal mines discovered by the Norwegian Baltazar Mathias Keilhau. In the aftermath of the separation between Sweden and Norway and in the light of the mining resources of Svalbard, many countries were claiming in part the jurisdiction. By the Spitsbergen Treaty of 1920 the right of utilization of natural resources, hunting and fishing was granted to the Soviet Union, Sweden, Norway and all the signatory countries. The carboniferous deposits, however, started to be systematically exploited in the first decades of last century, mainly by American companies, to the point that John Munro Longyear, head of the Artic Coal Company, established in 1906 a settlement that bore its name and which, in 1925, became the capital of the archipelago, with the name of Longyearbyen.

The Soviet Union also undertook a large-scale extractive activity in the archipelago, so much so that in 1934 soviet coal production reached 300,000 tonnes. The 1997 represented the starting date of the decline of the Russian production strategy, both because of a very serious accident, which led to the deaths of 23 miners, and the excessive costs of mining, processing and transporting coal.

The future of the archipelago began, then, to be more based than in the past on its position in the Arctic Sea, suitable to intercept the maritime routes along the two polar passages, at North-East and North-West. This fact could allow Svalbard to play a leading role in the future of intercontinental maritime transport on Arctic routes, with the creation of a large hub port in ice-free water for almost all the year, able to distribute goods through feeder services to the southern latitudes. At the same time, however, this possibility impacts against the environmental consciousness considering the ecological risks that a traffic of large ships could cause to the ecosystem of the archipelago.

Svalbard, in fact, are inserted in a context characterised by delicate environmental equilibria that, especially because of the climatic changes, experienced in the last decades at global level, are subject to a high level of risk.

The exceptional temperature variation with the sudden transition from extreme cold to heat and heavy rain instead of normal snow are among the typical traits associated with climate change, they influence the habitat and lifestyle of many animals that represent a symbol of the Arctic ecosystem: the wild reindeer, the rock ptarmigan, the vole and the arctic fox have dramatic impacts on their population due to the heavy rains on the snow followed by a sharp drop in temperatures. For some years, indeed, autumn has been very dissimilar from what it was in the recent past, with an average of about 10 degrees above the normal: this phenomenon is deeply changing the environment of the Svalbard; the fjord does not freeze and there are people fishing cod for longer time than in the past, and the presence of cod in the fjord is an indication of a warmer climate.

Unfortunately, nowadays, due to environmental severe pollution, even animals usually at the top of the food chain are now very exposed to the ingestion of toxins and plastics that could never have any direct food interest for them, as they were previously ingested by their prey or more easily because they are abundant in urban waste and dumps where increasingly these species find the necessary food with ease. The effects and consequences, depending on the animal species being considered, can be very different and rapidly varying, due to the continuous technological evolution that always introduces new substances on the market, producing a context in continuous evolution and difficulty to frame. In general, we note that “classic” toxic substances, such as PCB, tend to shrink significantly, while new toxins, such as organic bromide and fluoride compounds, appear to be growing rapidly and significantly, although with a less defined pattern.

We have also to consider that one of the main effects of global warming on polar area environment consists of a serious threat even for human life: the melting of permafrost could cause the collapse of buildings with consequential expansive operations of consolidation.

These aspects result more serious if we consider the type of tourism in this archipelago: the visitor is someone who looks for new experiences in unusual landscapes and really appreciate the sense of domination of the space (Figure 1). Even the images proposed from the tour operators remind the empty spaces of polar area, the direct contact with the wild, and so on [12].

**Figure 1**. A visit from the sea, Nordre Isfjorden National Park [13].

However, as the graph shows, the number of visitors traveling inland away from the settlements is in a positive trend, even more significant considering that the current official population of Svalbard is around 2650 inhabitants, a number that grows slightly in summer to decrease during the winter season, consisting mainly of young people: about 50% are in the age group between 25 and 49 years, 40% of these are employed in the growing cultural tourism industry, 12% in research and education while about 18% of all employees work in industrial production, construction and transport. Retail trade and public administration also represent a significant percentage of employment, equally shared between them.

The beginning of the real interest in sustainable tourism can be traced back to 1995, 75 years after the Svalbard Treaty. In that year the Store Norske Spitsbergen Kulkompani, an important Norwegian mining company, concessionaire for the exploitation of the Sveagruva coal basin (literally Swedish Mine), better known as Svea, located on the cape of Van Mijenfjord, was planning to build the first road of long range communication of the Svalbard to connect Svea with the inhabited centers of residence of their miners and, through Reindalen, the largest green area of the Svalbard tundra, to connect their mine with the port of Longyearbyen. With the precedent of the Svea mine, the other subscribing members of the Svalbard Treaty had also exercised their right to create dedicated road connections to allow the most rational movement of workers and goods from the various inhabited and port centers of the coast with the mining and industrial areas under their concession. This had led to a vast infrastructure program that would certainly have had a large impact on the Svalbard economy, while completely neglecting the negative effects on the environment.

Faced with such a potentially catastrophic scenario, some ecological NGOs launched an awareness campaign called “No Road trough Svalbard Wilderness!”.

The effect of the campaign was extremely effective thanks to the emphasis that the media gave it. The particularly favourable political moment for environmental issues imposed due attention on the Norwegian political world with consequent effect at parliamentary level which introduced a specific point of discussion called “the road on the ice” in their white paper on the future of Svalbard. Following this, Parliament decided to make “Svalbard the best managed wilderness area in the world” by asking the government to place areas of the Svalbard tundra, such as Reindalen, under maximum protection through the establishment of a series of new national parks.

In May 1996, an international symposium was held at Longyearbyen, with the participation of 45 delegates from the five Arctic countries, Germany, Sweden, the Netherlands and Great Britain. Then some guidelines for sustainable and responsible tourism were established, limiting, if necessary, the flows, establishing a “Code of Conduct for Tour Operators in the Arctic” for everyone interested in touristic activities in the Artic region in order to “Make Tourism and Conservation Compatible”, allowing activities compatible with the protection of the environment, recognizing a prevalent local content in the complex of tourist activities, providing, finally, common protocols in the training of guides. In a context like that of Svalbard, it could have been successfully established and accepted only a “niche” nature-based tourism. When structural and infrastructural adjustments would have been required, the relevant impact on the environment would have been assessed and controlled.

Since the Nineties, tourism at Svalbard has taken on ever greater dimensions. The motivations that attract the tourist to such a high latitude are represented, according to Viken [14] by the wild and uncontaminated nature of empty spaces, which are perceived as frontier. It is the same factor of attraction that drives thousands of tourists to visit places such as Cape North or Cape of Good Hope or Cape Horn: places at the End of the World, icons of the Great North, of the human limit, very different from familiar landscape contexts [15–17].

In the first phase, which we could define as proto-tourism, dating back to the late part of the nineteenth century, when hotels began to appear in the capital of the archipelago and when some small cruise boats carried out regular services from the port of Harstad, followed a second phase, inaugurated in the 1930s, with the creation of a small hotel also in the village of Nyalesund. However, the real take-off of the tourist sector in Svalbard took place only at the beginning of the years ‘90, with the gradual reduction of airfares, followed by a deregulation process [14].

As a result, tourism is currently one of the three areas of greatest economic interest in Svalbard. Cruise tourism is the main part with many operators and ships. The activity can be divided into two main categories: ocean cruise ships and expedition cruise ships.

When in 2003 was established the Association of Arctic Expedition and Cruise Operators (AECO), as an international association for expedition cruise operators in the Arctic and others with interests in this field, the industry took a major step in the right direction by drawing up guidelines for AECO members in order to meet the requirements of the authorities and to help stakeholders to “managing responsible, environmentally friendly and safe tourism in the Arctic and strive to set the highest possible operating standards”.

Although cruise activity around the Svalbard coasts have a long history, the sector has not been subject to systematic statistical surveys until 1996. Prior to this date, there is news of a small cruise traffic managed by a limited number of operators. Most of the small ships visited the west coast or the one around Spitsbergen. The number of locations where passengers could disembark has steadily

increased from 1996 to 2000. Other smaller expedition cruise ships appeared on the scene and began to visit new areas and disembark passengers in new places, including Eastern Svalbard. However, the number of people who used to go ashore remained reasonably limited and stable.

Statistical reports remained poor until 2000, but since 2001 operators have started to provide good feedback on their activities.

The number of locations considered for the landing activity has grown steadily from 120 in 2001, reaching a peak of 165 in 2005. New places have been tried, but not all have proved suitable. A rapid decline towards stabilization in 140 locations followed in the 2006–2009 period. Since then, the number of landing sites has increased, and 179 sites have been used in 2015. This is partly explained by a new "Sail & Ski" product type where cross-country skiing is the main activity. These cruise ships disembark passengers in places very different from those used until then [18].

Oceanic cruise ships normally disembark passengers only in one or two places in Svalbard (Magdalenefjorden and sometimes Møllerhamna), far from the settlements. The ban on the use of heavy fuel oil in coastal areas in 2015, the limits on the number of passengers with controlled access to cultural heritage sites have influenced the choice of routes and stopovers for large ships and have protected vulnerable areas of eastern Svalbard.

The growing interest in the Arctic with its virgin wild nature, magnificent scenery, exotic animal life and exciting relics of cultural heritage has influenced the long-term marketing of cruises, improved flight schedules, attracted more tour operators and ships and contributed to the increase in the number of overnight stays in Longyearbyen.

The number of oceanic cruise ships visiting Svalbard varied between 21 and 34 but increased in 2012, with a sharp drop from 23 in 2014 to 14 in 2015. The number of expedition cruise ships varied between 15 and 35, with a tendency towards more frequent visits with smaller ships.

Until 2007, the authorities did not place limits on the development of this activity, but restrictions on landings and increasing self-applied control through AECO will influence future development.

So, we can say that, if done correctly, cruise tourism can be ecologically favourable because cruises have the potential to make passengers more interested in the environment and sensitive to climate change, but in some cases, they can cause:

- diffusion of alien algae species with damage to biodiversity;
- stress for the most sensitive and vulnerable fauna;
- damage to the vestiges of the local cultural heritage;
- pollution (especially in the case of groundings or accidental spillage).

It should be noted that several expedition cruise ships join the annual "Clean-up Svalbard" action, removing around 20 tons of waste from the beaches of Svalbard, the bulk consisting of plastic pollution local shipping and commercial fishing. Before leaving Svalbard from the port of Longyearbyen, the visitors deposit all collected litter into dedicated bins to allow a process in an environmentally friendly manner.

It is important to monitor the progress of the cruise tourism market to identify potential risks or threats of damage to Svalbard's natural or cultural heritage. Therefore, MOSJ (Environmental Monitoring of Svalbard and Jan Mayen), an environmental monitoring system that is part of the government's environmental monitoring in Norway, has identified two data that describe the characteristics of the sector:

1. The total number of visitors landed indicates the volume of the activity (Figure 2).

2. The number of disembarkation points chosen by cruise ships indicates whether traffic tends to spread to new areas (Figure 3).

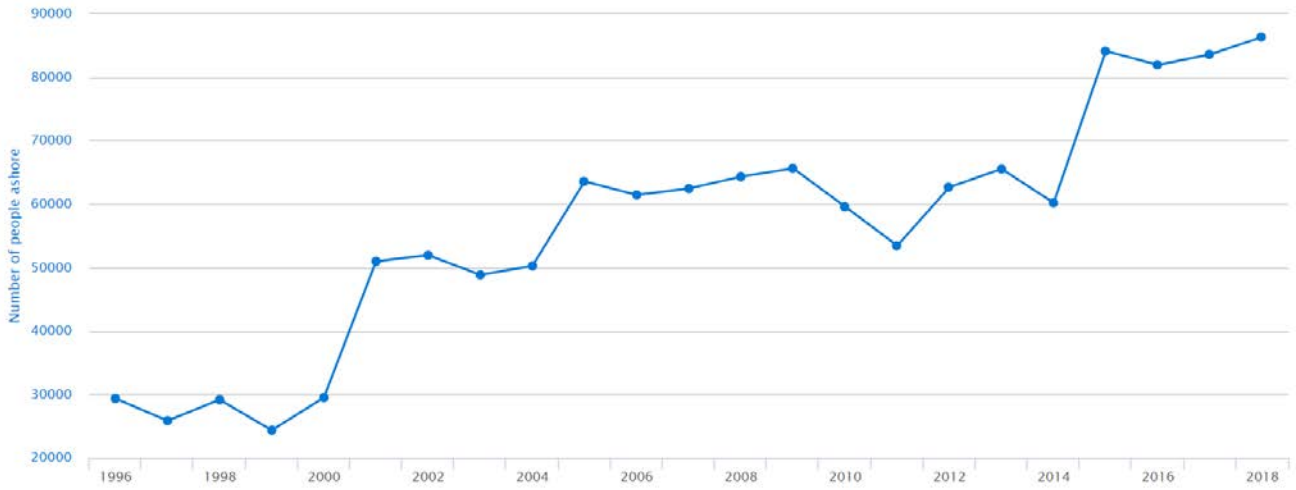


**Figure 2**. Svalbard islands: number of visitors disembarked in places far from settlements [19].

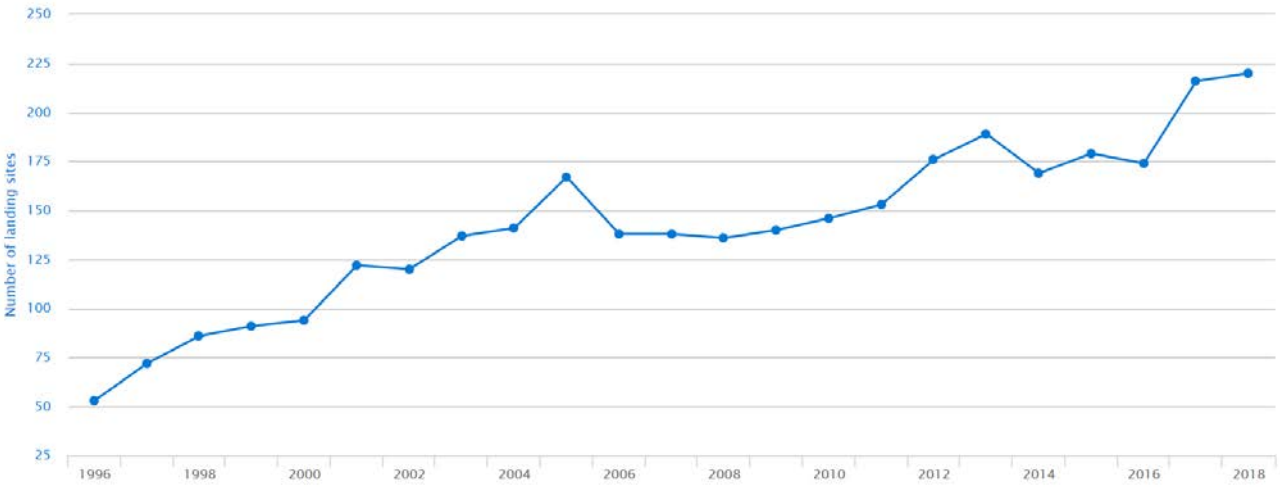


**Figure 3**. Svalbard Islands: number of places chosen for the disembarkation of visitors in places distant from settlements [19].

An increase in the number of people disembarking or in the number of places chosen for disembarkation will show MOSJ analysts and environmental control authorities if the phenomenon is sustainable or if more detailed information or other urgent actions are needed.

The numbers are significant for the volume and importance of the activity. The number of visitors who disembarked remained fairly stable from 1996 to 2000. The following year, the number of tourists disembarked grew and, after a period of constant increase, there was a sudden reduction in the two-year period 2010/2011 in conjunction with the peak of the world economic crisis which imposed an austerity regime also on the tourism sector. Since 2011, visitors have started growing again. This increase is mainly linked to the strong increase in cruise activity with oceanic vessels

previously engaged on Mediterranean and Middle Eastern routes and ports, which have become unsafe due to the socio-political instability of those areas compared to the quieter northern European and Arctic area.

The largest increase was recorded in 2015, with + 40% compared to 2014. Small expedition cruise ships have steadily increased over the years and have contributed substantially to the increase in 2015.

This analysis shows that tourism with a prevailing naturalistic interest, suitably planned and monitored, encourages the investments in protection and enhancement of local environmental resources, thus representing the most suitable solution for achieving sustainable development even in the Svalbard archipelago. Here, in fact, to a worrying extent, climate change has profoundly altered the equilibrium of the ecosystem, causing migrations of arctic species, the emergence of new species normally living on mainland Norway and new plants that they grow up in the place of species more resistant to polar cold and now they are struggling to develop.

No less concern is the danger for the inhabitants represented by the possible collapse of buildings built on the ground where the permafrost thaw occurs, which, among other things, necessitates costly consolidation and maintenance interventions. To this is added the problem of avalanches, which also affected the city centre of Longyearbyen, making it a part uninhabitable.

Yet, Arctic changes are not just about this region, but they are also affecting the rest of the world. The displacement of the low pressure to the north causes more rainfall in Scandinavia, while in the Mediterranean region there are more dry winters. The most serious consequences are, however, in global food security, in which, to make the costs, are the economically most depressed areas, which will be an example in the next paragraphs.

## 4. The Kiribati archipelago

The Republic of Kiribati (1°28′N–173°02′E), consists of 33 islands, inhabited for more than two thousand years by Micronesian people, were discovered quite late by the European explorers: it seems that Magellan, on his first tour of the world, saw Carolina Island in the equatorial Sporades. The maximum height of the islands, few meters above sea level, exposes them to serious risks of disappearance because of the progressive and unstoppable rise of the level of the oceans, direct consequence of the climate change.

The population of the archipelago, called I-Kiribati or also “Gilbertesi”, is made up of about 92,000 residents, more than half of whom are concentrated in the southern area of the Tarawa atoll, a densely populated area with an annual growth rate by 3%. Most of the population is employed in strictly subsistence activities, including fishing and agriculture, mainly bananas and copra (dried coconut). The land, consisting essentially of sand carried by the sea and the wind, is not very fertile with very low productivity also due to the limited possibility of irrigation due to the shortage of fresh water. However, the sea is full of life and therefore the catch and the copra have always represented most of the production and exports. However, the I-Kiribati are among the poorest populations in the Pacific and their environment is one of the most vulnerable to the consequences of climate change. This is due to the physical structure of the coral atolls which emerge a few meters above sea level and which offer the population no possibility of refuge in the event of cyclical or exceptional rises in the event of tides or tsunamis or, worse, in the event of slow but unavoidable rise following the melting of polar glaciers. If we add to this the very limited economic possibility of the nation and the

concentration of the majority of the population on a dominant atoll, we can understand how reduced the resilience of these areas of our planet can be, which sees its food and water sources in serious danger and with these the health of the population and the very survival of its territory, in the presence of a government with very limited resources to face a crisis of this magnitude.

The United Nations Intergovernmental Panel on Climate Change (IPCC) believes that sea level will rise by more than 2 meters by 2100, due to the melting of polar glaciers as a consequence of global warming, and that a further subsequent increase would seem inevitable. It is therefore probable that within a century the agricultural areas of the Kiribati archipelago will become completely arid due to the increase in the salinity of the soil, the contamination with saltwater of the reserves for irrigation or disappear by submergence. Indeed, the people of Kiribati are aware of the effects of climate change on their environment and fishing activities. However, not having adequate knowledge in the environmental field, they cannot understand its origin and often tend to believe that the changes they are experiencing are due to the divine will rather than to the human activities and his recent ecological and environmental behaviour.

In the 2004 Otin Taai Declaration, the Kiribati government stated that human-induced climate change will have serious adverse effects on the environment and population of the Pacific Islands, including:

- increase in the frequency and strength of floods and storm surges with consequent damage to coastal infrastructures and loss of areas emerged due to erosion;
- increase in the frequency and severity of cyclones with risks for human life, health, homes and communities;
- damage and loss of coral reefs with negative impact on the marine ecosystems on which the livelihood of many islanders depends;
- increase in average temperatures and alteration of the rainfall cycle with an increase in drought in some areas and floods in others with consequent loss of sugar cane, sweet potatoes, taro and cassava crops;
- sea level rise and flooding with pollution and loss of drinking water reserves also following changes in the rainfall cycle.

The problems related to sea level rise on the populations of the coral archipelagos of the Pacific, resulting from the melting of polar glaciers, are aggravated when they add to the effects of other large-scale natural phenomena that periodically act on atmospheric pressure and on the climate of vast areas of the planet. This is the case of the Pacific decadal oscillation (PDO), a long-term climate fluctuation like the El Niño-Southern Oscillation (ENSO) cycle of El Niño/La Niña (which has a period of about 5 years) but with amplitude and periodicity much wider (20/30 years).

In addition to the effects on the sea level and consequences on the orography of the atolls, the climatic events linked to the El Niño/La Niña cycle have a significant influence on the conditions of the natural resources to which the local populations refer for their livelihood. Fishing is the main economic sector of Kiribati which constitutes more than 30% of total exports and represents the main source of sustenance and food for all the populations of the archipelagos of the Equatorial Pacific. A contraction in this sector due to a reduced availability of quality fish species would therefore represent immediate damage to the already significantly reduced standard of living of these populations.

Lehodey [20] notes that by analysing the changes in habits of fish species typical of the area during the events of El Niño and La Niña, significant indications can be drawn on what can be

expected soon as a consequence of the global warming. For example, even without reaching numerically significant estimates, it shows that tuna and thunnini in general, the main catch for economic and food interest of the Kiribati populations, reacted relatively quickly to climate change, abandoning fishing areas usually rich in order to move towards new locations where conditions more similar to those in which he lived before the climatic changes exist to reach their prey.

The migration occurs without substantial variations on the size of the fish population and entails the consequent need for fishermen to reposition themselves in their fishing campaigns during the events of El Niño and La Niña. In recent decades, tuna fishing in the tropical Pacific Ocean has increased steadily, also to meet the increased demand for export and thanks to more effective fishing techniques. However, it is expected that following a longer duration and frequency of El Niño phenomena, the movements of the tuna fishing areas could be more structural, pushing the thunnini to move away from the equatorial area toward the neighbouring tropical areas with a general decline in the abundance of tuna in the area of the Kiribati archipelago [21].

In 2000 there was an unusually rapid oscillation in the El Niño/La Niña cycle with more extreme tide levels and during the phase period with the so-called Perigeo spring tide (also “king tide”) caused floods of sea water in the lowlands of Kiribati islands.

Unfortunately the dimension of the problem that the Kiribati population is facing is so big that every effort or action they can put in place, even with the help of more powerful World organisations, appear ineffectual to avoid a disaster that is now considered as irreversible, to the point that the “Not If but When” World Bank report in 2006, confirmed this unavoidable final situation for countries like Kiribati and the likelihood of them to consider to migrate to escape extreme disasters. It appears clear that it is time for the Pacific nations to elaborate and put in place opportune natural risk management actions, considering adaptation plans in their national development policies.

The islands of the Pacific Ocean are divided into continental and oceanic; the first, originating from partially submerged continents are in the western Pacific, west of the geological separation line called “Andesite Line”, the second east of that line.

It is possible to date the beginning of Western Polynesian culture around the first millennium BC, a period in which Polynesian culture and language began to emerge in Western Polynesia.

The continental islands, thanks to the rocky nature of their territory, have always offered conditions suitable for a stable settlement.

The oceanic islands, of which the Kiribati archipelago is part, often formed on top of submerged volcanoes, are atolls low on the sea level, much more exposed to climate change, with less favourable conditions for a stable settlement for their populations.

These archipelagic areas have therefore always been affected by mass migration, for reasons ranging from the search for new areas to be exploited for food purposes and as a basis for trade to the need to abandon areas that have become inhospitable or dangerous to upheavals due to volcanic or climatic factors. Their inhabitants have always been skilled navigators who, thanks to the knowledge of astronomical navigation and the ability to use currents and large ocean waves advanced east on small outriggers canoes to find new and more abundant food resources. Taking advantage of the trade winds they sailed back to the west with their cargo of merchandise, maintaining economic and cultural links with the bases of departure or the lands of origin. These movements could take a very long time or sometimes they were without return giving rise to new settled populations that preserved memory of their origin by orally passing on their traditions as is still the case among the Maori of the New Zealanders who use to identify themselves with a long song that allows them to go up, from

generation to generation, up to one of the seven canoes from which they had landed in their new homeland centuries before.

The search for a new land on which to transfer the entire population of the Kiribati archipelago to find more suitable living conditions is therefore not such an alien hypothesis for populations on this part of the planet, as we will see in the course of this study.

The urban and housing situation and, more generally, the situation of the Kiribati infrastructures is very difficult. In many homes there are no real toilets and when present they are often without connection to the city sewage system (in those urban centers where it exists) and frequently the population uses beaches and agricultural land for personal physiological and toilet needs.

In the city area of South Tarawa the sewage system dates back to almost 30 years ago when, for the limited funds available, it was built of insufficient length to bring the waste water beyond the coral reef to an adequate depth, with consequent resurfacing of sewage and return of polluted sea water to the inner beaches of the lagoon. The current more extreme weather conditions with higher tides have caused polluted seawater to penetrate underground reaching freshwater reserves with significant contamination of the domestic water network and a serious threat to the health of the population.

One of the main consequences of this stressful and difficult situation is the increase of emigration, especially to New Zealand. Between 2001 and 2006 censuses the residents of I-Kiribati increase of 34%, bringing the total to 1116.

Since the Brundtland Report [22] in 1987, several initiatives have been adopted by the United Nations to mitigate the environmental impact of climate change. However, the plurality of economic and political interests represented in the UN and its different sensitivities to safeguarding the ecosystem makes the action too long for truly effective interventions, especially in the most serious cases. For this reason, initiatives of co-ordination are being developed between those states which, for their peculiar aspects, are less resilient to the effect of climate change. For instance through the Small Island Developing States (SIDS) and the United Nations Office for South-South Cooperation (UNOSSC) they decided to mutually support and make more effective their action in defence of their specific interests, through timely coordination and information action, to effectively exploit solidarity among the peoples of the "south of the world", and in view of specific triangulation with northern areas. Among the most effective initiatives is the Climate Early Warning System (CLEWS) project, which includes the state of Kiribati in addition to Cook Islands, FSM (also known simply as Micronesia), Marshall Islands, Nauru, Solomon Islands and Tonga. The partners, using joint UN-India funding, decided to share knowledge to improve the efficiency of a common alert and emergency network, to address hydrology challenges and water-related problems in the Pacific [23].

In this context some Pacific Ocean governments and official bodies such as Australia, the Global Environment Facility (GEF), Global Facility for Disaster Reduction and Recovery (GFDRR), Least Developed Country Fund (LDCF), Policy and Human Resources Development (PHRD), decided to support the objectives of the Republic of Kiribati National Adaptation Program of Action (NAPA) that during the period 2012–2016 worked to assess and protect available water resources and manage inundation effects. Among the most urgent objectives are considered the initiatives to optimize the management of water resources for civil use, the protection of the coasts through the replanting of mangroves and other autochthonous flora with high tenacity and, more generally, the maintenance and reinforcement of public infrastructures and finally an urban and demographic

planning compatible with a more efficient reduction of risks through highly effective civil protection plans.

Similarly, European Union in 2015 decided to increase the support already granted to Kiribati between 2008 and 2013 with €23 million, representing an increase of the 80%. The Commissioner announced the new commitment in Bruxelles as he joined Anote Tong, President of Kiribati, to sign the National Indicative Plan 2014–2020 for Kiribati under the European Development Fund. The new funding will be spent on the socio-economic development to improve economic opportunities and, thereby also helping to alleviate growing climate change threats affecting the main island Tarawa as well as poverty. It includes supportive measures such as enhancing administrative capacities and boosting civil society organisations.

The European Commission has announced its decision to support the 2014–2020 national indicative plan for Kiribati under the European Development Fund during a visit to Brussels by Anote Tong, President of Kiribati. The new funding supports socio-economic development initiatives to help the population of Kiribati improving economic opportunities, along with practical initiatives aimed at addressing the most dangerous threats to climate change for private and public property on the main island of Tarawa. It also includes measures to improve the efficiency of administrative and bureaucratic organization.

During the 2014 meeting in Palau of the Pacific Small Island States (SIS), President Anote Tong, together with other leaders from Tuvalu and the Marshall Islands, asked to consider the seriousness of climate change and called for immediate action. especially in order to protect and strengthen jurisdictional borders and governance to improve and monitor unreported and unregulated (IUU) illegal fishing and maintain Kiribati national sovereignty and maritime border rights in the case (or more realistically when) Kiribati islands would disappear. President Tong also stressed the need to take the necessary measures to improve the efficiency of fishing in the Pacific in order to maximize returns for the benefit of local populations as real owners of resources, improving local factual participation in the sector, particularly in the onshore working cycle where the greatest added value is. In his action, President Tong identified the sustainable management of the Pacific Ocean as the key to further the recognition and conservation of ocean rights.

Tourism remains one of the sectors still active in the economy of Kiribati even if the importance of this sector in total Country economy is decreasing (Figure 4).

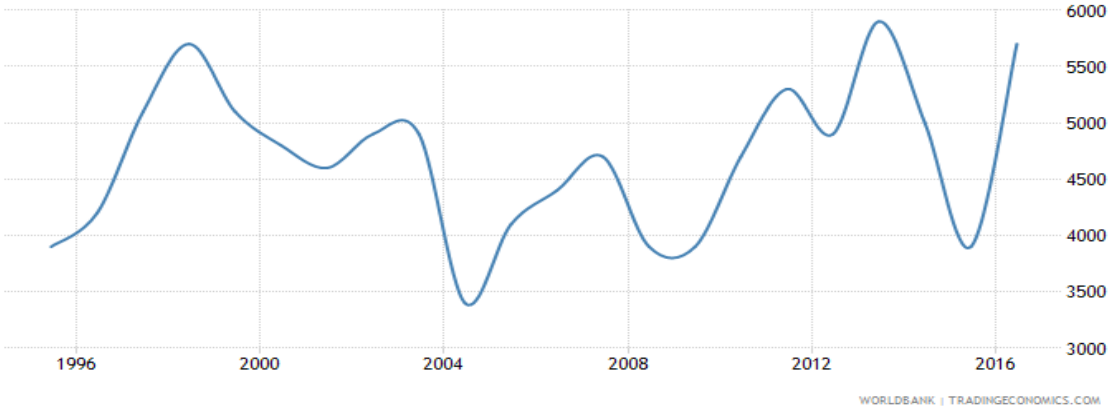


**Figure 4**. Kiribati tourism—Outsiders, number of arrivals [24].

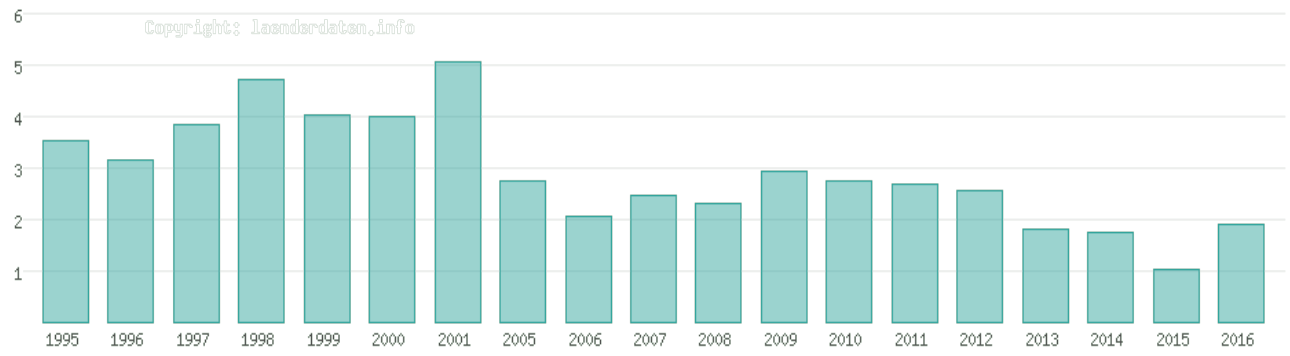


**Figure 5.** Kiribati tourism—Outsiders, percent of the GNP [24].

In 1995 the turnover of tourism activities amounted to about 2 MUSD, equal to about 3.6% of GNP (Figure 5). Considering that the number of tourists was around 3900 visitors, this corresponded to around 513USD per person/visit. In the following 21 years, tourism-related activities declined dramatically to recover in the last year of the survey when revenue reached 3.40 MUSD, equivalent to 1.9% of GNP, and each visitor's local expenses reached an average of 596USD per visit.

## 5. Conclusions

The environmental modifications due to climate change may be a problem at all latitudes.

This work, which has examined two extremely different contexts from the natural point of view because they are placed at extreme latitudes, one at the North Pole area and the other at the Equator, has shown that, although with different connotations, the raising of temperatures and the level of the oceans, increases the risk of extinction for many animal and vegetable species. Yet, from an economic point of view, climate change takes on different connotations depending on whether you are facing an economically advanced Country or a “Southern world” Country.

In the case of Kiribati, a republic of simple economy closely linked to traditions and the exploitation of natural resources, based almost exclusively on fishing and tourism, the rise in climate and ocean level will determine the crisis of these activities. The flooding of inland areas with seawater will produce the gradual impairment of freshwater reserves, therefore the impossibility not only to accommodate tourists, but even to continue to reside on the spot by part of the same inhabitants of the archipelago that, if this inexorable process is not slowed down, will be destined to disappear.

In the case of the Svalbard Islands, however, archipelago located “in the North of the World”, from the geographic point of view and of the development, if the rise of the temperature produces devastating effects on the natural environment, as it happens for the Kiribati, it is even true that, from the economic point of view, the “liberation” of the ice coasts for the whole year, would allow all the Countries bordering the Arctic Ocean, to intercept the maritime routes that now take place along the two passages to the Northeast and Northwest, and to represent new logistic nodes towards the southern markets, giving way to new international geopolitical scenarios. In other words, there would be then no real economic interests to halt the process of climate change, although this will ultimately lead to the disappearance of islands, histories, identities and cultures.

The World Tourism Organization (UNWTO), the United Nations agency for the promotion of a responsible, sustainable and universally accessible tourism [25], stresses the need to plan a tourism that, while safeguarding the balance and integrity of the ecosystem, protects the economic growth and social equity of the host populations by establishing an appropriate balance among economic, environmental and cultural aspects, to ensure their long-term sustainability.

In addition to these objectives, especially in those areas most subject to environmental alterations related to climate change, there is also that of proper public awareness of the effects that would arise, sometimes irreparably, if inadequate attention is paid to degenerative climate-related phenomena. This is particularly happening in the case of the two archipelagos analysed, until a few years ago virtually unknown to the general public and today considered an emblem of the environmental problem because of the risk of disappearance of unique ecosystems in their respective contexts, together with their identities and cultural memories. Thanks to the right emphasis that these problems are receiving at local and global level, including through UN initiatives, effective actions are being made to mitigate the effects of climate change through specific and coordinated interventions that often may require significant investment far beyond the economic resources of local populations and, above all, by moderating any plan that could use the effects of climate change to distort these realities in a globalised economy as in Svalbard case. Investing in sustainable tourism, in the extreme case of the Kiribati Islands where the population risks to be obliged to leave their homeland because of its physical disappearance, can guide also in the choice of potential areas of migration, which if similar to the original ones for territorial aspects, would allow an effective and rapid relocation of culture, tradition and commercial ability, permitting a people, otherwise eradicated from their roots, to transplant themselves into a new context, with acceptable level of social stress.

## Conflict of interest

All authors declare no conflicts of interest in this manuscript.

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