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Keywords: circular economy, circular processes, circular tourism, climate change.

Parole chiave: economia circolare, processi circolari, turismo circolare, cambiamento climatico.

JEL: Q01, Z32

From linear to circular tourism¹

Tourism is the third largest socio-economic activity in the EU and thus it can be considered an engine for development, producing many positive impacts, from trade sector to employment. At the same time, it can produce many negative impacts because it is configured according to the model of linear economy.

A deep analysis of impacts produced by tourism sector and its great potential in contributing to the achievement of SDGs are presented.

The aim of this paper is to identify a tourism development/management model able to produce multidimensional benefits and, simultaneously, reduce (environmental, social and economic) costs. In this perspective, the circular economy is proposed as a model able to contribute to make tourism more sustainable. This model necessarily requires appropriate evaluation tools, indicators and knowledge.

1. Introduction: an overview on tourism sector

Tourism represents a part of the modern lifestyle and it is characterized by two critical parameters: the geographical mobility and the cultural enjoyment (Fusco Girard and Nijkamp, 2009).

The relationship between tourism sector and sustainable development assumes a central role in our increasingly urbanized world that requires the identification of new models to increase urban productivity and make development more sustainable.

According to the International Recommendations for Tourism Statistics 2008, "tourism is a social, cultural and economic phenomenon related to the movement of people to places outside their usual place of residence, pleasure being the usual motivation" (United Nations and UNWTO, 2008), but also for other reasons "such as leisure, business, religious or health reasons and other purposes such as visiting friends and relatives".

Tourism is the third largest socio-economic activity in the EU (following the trade and distribution, and construction sectors) (European Parliament, 2015a). So, it is one of the activities that mainly support the economic sector. In fact, over the years, from 2007 to 2016, the contribution of tourism to GDP has been about 9-10% (Tab. 1) and

¹ *This paper is the result of the joint work of the authors. In particular, it is possible to attribute §§ 1 and 6 to Luigi Fusco Girard; §§ 2,3,4,5 to Francesca Nocca.

Table 1. Participation of tourism in GDP, in %.

	2007	2008	2009	2010	2011	2012	2013	2014	2015
WORLD	9,6	9,4	9,3	9,0	9,1	9,1	9,2	9,3	9,3
Europe	8,1	8,0	8,0	7,7	7,6	7,7	7,6	7,6	7,7
EU 27	8,3	8,1	8,1	7,8	7,8	7,8	7,8	7,8	7,9
Croatia	27,6	28,5	25	26,3	27,5	29	29,7	30,1	30,5
Macedonia	5,1	5,2	5,2	5,1	5,2	5,5	5,6	5,7	5,7
Montenegro	21,6	24	16	15,7	17,1	19,7	22,9	25,5	27,4
Serbia	6,1	5,9	7,5	7,8	8,0	8,0	8,0	8,0	7,9
Austria	12,1	12	12,3	11,7	11,8	12,2	12,5	12,6	12,8
Greece	17,3	16,5	15,2	15,3	15,7	16,3	16,7	16,9	17,1
Italy	9,3	8,7	8,4	8,4	8,5	8,7	8,8	8,9	9,0
Portugal	13,6	14,2	13,3	13,8	14,7	15,1	15,4	15,6	15,7
Spain	14,9	14,9	14,7	14,3	14,3	14,4	14,4	14,3	14,3

Source: (Vujovic et al., 2016).

in 2016 has supported over 200 million jobs (direct, indirect and induced impacts) (UNWTO, 2016). It employs 1 every 11 people globally (WTTC, 2017).

Tourism has had an uninterrupted growth over time, despite crisis and occasional shocks, demonstrating that the sector is strong and resilient (UNWTO, 2016).

International tourist arrivals have increased from 25 million globally in 1950 to 278 million in 1980, 674 million in 2000, and 1186 million in 2015 (UNWTO, 2016).

Tourism sector is the main category in the international trade of services. To date international tourism represents 7% of the world's exports in goods and services, up from 6% in 2014, as tourism has grown faster than world trade over the past four years.

As reported by the UNWTO, the World Organisation of the United Nations for Tourism, the number of travelers has almost reached one billion and 200 thousand people in 2016 (Tab. 2), just over one-seventh of the world population. It is very good for the economy but, at the same time, it represents a delicate issue for the environment and the planet. It creates wealth, but simultaneously has within it the seeds for its erosion.

As highlighted in Table 2, in Europe there is the major attractiveness capacity. In fact, it attracts 51% of international tourist arrivals. Of course, this means more management problems and more necessity for new sustainable management strategies.

Tourism sector in many developing (and least developed) countries is one of the principal sources, and in some countries the main source, of foreign exchange earnings; quite often, it is the most viable and sustainable economic development option, with positive impacts on reducing poverty levels (UNWTO, 2010).

Table 2. International tourist arrivals and International tourism receipts (2016).

	International tourist arrivals	International tourism receipts
Africa	53 million (5%)	33 US\$ bn (3%)
Americas	193 million (16%)	304 US\$ bn (24%)
Asia and the Pacific	279 million (24%)	418 US\$ bn (33%)
Europe	608 million (51%)	451 US\$ bn (36%)
Middle Est	53 million (4%)	54 US\$ bn (4%)
Total - World	1186 million	1260 US\$ bn

Tourism sector is able to produce a lot of economic benefits (Fusco Girard *et al*, 2015) including positive impacts on local economies and small businesses.

An increasing number of countries have invested in tourism, turning it into a key driver of socio-economic development through the creation of jobs and enterprises, export revenues, and infrastructure development.

It can be considered an engine for development, producing many positive impacts, from trade sector to employment. It has a very great potential in enhancing human capital, producing for example employment and decent work. This capacity to produce employment is a key aspect of its contribution to sustainable development.

At the same time, however, it can produce negative impacts: it can be the cause of environmental damage and pollution, heritage degradation, etc. because it is configured according to the model of linear economy (take-make-dispose). It is the expression of disposable model.

It accounts for about 5% of global CO₂ emissions (mainly generated by transport and tourism facilities). Accommodation facilities are often the major consumers of non-renewable and precious resources (in some areas a resort may consume more water per person than the local community with which it competes for supply). It can produce negative impacts on biodiversity and cultural landscape. A bad visitor management can pose a threat.

These several negative impacts that tourism sector can produce highlight the necessity for tourism to be well planned, managed and monitored. It recalls to efficient policies and actions to plan and manage the sector in order to reduce negative impacts.

Tourism planning and management should meet simultaneously needs of visitors, environment, community, industries, etc. It should be configured according to sustainability principles.

After an analysis of sustainable tourism (second paragraph) and its contribution to the achievement of Sustainable Development Goals (third paragraph), the impacts of tourism sector on climate change are highlighted (fourth paragraph).

Surely the tourism sector is able to produce wealth in the short time, but the net benefits can be much less in terms of direct and indirect costs (considering

for example the environmental impacts described in the following paragraphs). It needs to find new tourism management strategies able to reduce costs (environmental, social and economic ones) and produce more benefits. In this perspective, the circular economy is proposed as a model able to contribute to make tourism more sustainable (fifth paragraph).

2. The concept of Sustainable Tourism

Sustainable Tourism can be defined as the “tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities” (UNWTO and UNEP, 2005 p.11-12).

It aims to “satisfy the need of tourists and hosting regions and, at the same time, preserves and improves future opportunities” (UNWTO, 1998).

The American International Ecotourism Society, moreover, defines sustainable tourism as a “responsible travel to natural areas that preserves the environment and improves the welfare of local people” (TIES, 1990).

Tourism sector needs to find a balance among the different dimensions of sustainability (environmental, economic, socio-cultural dimensions) to ensure a long-term sustainable tourism.

Thus, sustainable tourism should (www.unwto.org):

- Make optimal use of environmental resources. It represents a key element in tourism development, maintaining essential ecological processes and contributing to conserve natural heritage and biodiversity.
- Respect the socio-cultural authenticity of host communities, conserve their cultural heritage (tangible and intangible), and contribute to inter-cultural understanding and tolerance.
- Ensure viable, long-term economic operations, providing socio-economic benefits to all stakeholders that are fairly distributed (i.e. stable employment and income-earning opportunities and social services to host communities), and contributing to poverty alleviation.

UNWTO and UNEP identified 12 aims for sustainable tourism (UNWTO and UNEP, 2005; UNWTO, 2013):

- **“ECONOMIC VIABILITY:** To ensure the viability and competitiveness of tourism destinations and enterprises, so that they are able to continue to prosper and deliver benefits in the long term.
- **LOCAL PROSPERITY:** To maximize the contribution of tourism to the prosperity of the host destination, including the proportion of visitor spending that is retained locally.
- **EMPLOYMENT QUALITY:** To strengthen the number and quality of local jobs created and supported by tourism, including the level of pay, conditions of service and availability to all without discrimination by gender, race, disability or in other ways.

- **SOCIAL EQUITY:** To seek a widespread distribution of economic and social benefits from tourism throughout the recipient community, including improving opportunities, income and services available to the poor.
- **VISITOR FULFILLMENT:** To provide a safe, satisfying and fulfilling experience for visitors, available to all without discrimination by gender, race, disability or in other ways.
- **LOCAL CONTROL:** To engage and empower local communities in planning and decision making about the management and future development of tourism in their area, in consultation with other stakeholders.
- **COMMUNITY WELLBEING:** To maintain and strengthen the quality of life in local communities, including social structures and access to resources, amenities and life support systems, avoiding any form of social degradation or exploitation.
- **CULTURAL RICHNESS:** To respect and enhance the historic heritage, authentic culture, traditions and distinctiveness of host communities.
- **PHYSICAL INTEGRITY:** To maintain and enhance the quality of landscapes, both urban and rural, and avoid the physical and visual degradation of the environment
- **BIOLOGICAL DIVERSITY:** To support the conservation of natural areas, habitats and wildlife, and minimize damage to them.
- **RESOURCE EFFICIENCY:** To minimize the use of scarce and non-renewable resources in the development and operation of tourism facilities and services.
- **ENVIRONMENTAL PURITY:** To minimize the pollution of air, water and land and the generation of waste by tourism enterprises and visitors”.

Sustainable tourism is based on policies able to create relationships and produce synergies among local government, local community, private sector, non-profit organizations, academic institutions. In this way, it is possible to develop practices able to protect and valorize natural and cultural landscape compatibly with economic growth (Edgell, 2006).

It needs to effectively implement tourism policies and strategies based on sustainability principles, at national level, but also at local one.

In a multi-dimensional sector as the tourism one, adequate policy and regulatory framework are necessary, also to encourage private sector and other stakeholders to work with government on tourism planning, development and management. Sustainable tourism necessarily requires awareness and a wide participation of different stakeholders.

There are many stakeholders and actors that are engaged in or affected by the tourism sector, both directly and indirectly: international development assistance agencies, National Government, Local Government and destination bodies, Private sector businesses, Employees and related bodies, NGOs - International, national and local, Education and training bodies, Local community, Consumers/ tourists. All of them can play a role in achieving sustainable tourism.

Each stakeholder can play an important role in the achievement of sustainable tourism. At the same time, many of them have the potential to produce negative

impacts (i.e. conflicts between tourists and inhabitants) influencing the territory. They are related not only to the potential congestion of public spaces and infrastructures, but also to inflationary processes, both in commercial services (shops, restaurants, etc.) and in the real estate market. Inhabitants feel often tourism as a threat to the preservation of their culture. An excessive tourism flow can transform places from places to live in places to consume, causing the arising gentrification phenomenon processes of depopulation.

In order to limited negative impacts and conflicts among different stakeholders, it is necessary to consider also social and cultural components in tourism development/management strategies. Furthermore, actions have to arise from bottom-up approaches, through community involvement. Collaborative processes are important to resolve differences in order to reach consensus and adopt decisions that can be effectively and sustainably implemented and can produce benefits for all stakeholders.

All actors and stakeholders should not be considered individually, but it is important to understand relationships among them. A fundamental condition to achieve sustainable tourism is the collaboration among different stakeholders. They should effectively work together in planning and management of the sector and implementation of projects and activities. It needs to transform the heterogeneous interests in a co-evolutionary process to a positive sum game (the above mentioned circularization processes aim to achieve this goal). It is also important to identify the relationships between tourism sector and other aspects/sectors (as agricultural, handicraft, etc.).

A significant form of tourism sector is the cultural tourism, accounting for 37% of global tourism, with growth rates of 15% per year. However, this sector is often characterized by seasonality: it produces benefits for a limited period of the year, not ensuring continuity. So, it needs to be supported by other functions able to attract visitors during the whole year.

There is a close relationship between tourism sector and landscape, its beauty, its attractiveness, its accessibility, its "significance". The landscape is considered as a "complex system" consisting of combinations of and interaction among six perceived landscapes: natural, man-made, man-made/cultural, financial, social, and human landscape (Fusco Girard, 2014). The spirit of a place rises from the specific combination of them. Some of these landscapes are in mutual relationship each other. Simultaneously, tourism can contribute to the enhancement/deterioration of these different landscapes and, vice versa, it can be affected by the quality of them. Tourism can also contribute to improve synergies and relationships among the six landscapes.

For this reason, policies and actions related to cultural and natural landscape conservation/valorization are important for tourism sector development. At the same time, actions related to tourism sector have to guarantee the conservation and valorization of landscape and not pose a threat for it.

There is also a relationship between tourism sector and climate change that will be discussed in the 4 paragraph. Actions in this sector should promote sustainable production and consumption, including reducing the use of resources such as water and energy, in order to contribute to mitigate climate change.

3. The role of Sustainable Tourism in the achievement of SDGs

Tourism sector is one of the largest dynamic economic sectors in the world. Recognizing the considerable opportunities and issues involved in the development of tourism, it can play a significant role in achieving sustainable development.

The document "The Future we Want" (outcome document of Rio+20) includes sustainable tourism as contributing to green growth. Tourism was included in the RIO+20 outcome document as a thematic area and cross-sectorial issue that "...can make a significant contribution to the three dimensions of sustainable development, and having close linkages to other sectors, create decent jobs and generate trade opportunities..." (United Nations, 2012).

Furthermore, the potential of tourism for poverty alleviation and development has found space in the discussion about the Millennium Development Goals (MDGs) and then the Sustainable Development Goals (SDGs) (United Nations, 2015).

In order to develop tourism sector in a sustainable way considering impacts from tourism, many projects and processes have been launched.

Tourism has become a pillar of economies, "a passport to prosperity". We should harness the potential of tourism sector to implement the 2030 Agenda for Sustainable Development (United Nations, 2015) and to achieve the SDGs, and thus to achieve "the future we want".

Currently there are 3 goals explicitly referred to sustainable tourism: the goal 8 (about inclusive and sustainable economic growth), the goal 12 (about sustainable consumption and production patterns) and the goal 14 (about conservation and sustainable use the oceans, seas and marine resources for sustainable development).

In particular, there are 3 targets referring to sustainable tourism:

- 8.9 (By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products);
- 12b (Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products);
- 14.7 (By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism)

According also to UNWTO, tourism sector can contribute to the achievement of almost all goals (directly or indirectly) and the implementation of the post-2015 development agenda (Tab. 3).

4. Tourism sector and climate change

The tourism sector is at the same time both "a vector and a victim" of climate change (UNWTO Secretary-General, Taleb Rifai). Climate change is the most important challenge of XXI century.

Table 3. Relation between tourism and SDGs (adapted from UNWTO).

SUSTAINABLE DEVELOPMENT GOALS
<p>Goal 1. NO POVERTY - End poverty in all its forms everywhere</p> <p>Tourism is one of the most important sectors for economic growth. It is able to foster economic growth and development providing income through job creation (and thus contributing to poverty reduction). Sustainable tourism, in particular, has an important potential to reduce poverty by implementing the development of small business and promoting entrepreneurship.</p>
<p>Goal 2. ZERO HUNGER - End hunger, achieve food security and improved nutrition and promote sustainable agriculture</p> <p>Agricultural production and the growth of agro-tourisms can be stimulated by the sale and consumption of local products, with a resulting increase in communities' income and in the improvement of agriculture itself.</p>
<p>Goal 3. GOOD HEALTH AND WELL-BEING - Ensure healthy lives and promote well-being for all at all ages</p> <p>Tax income from tourism could be used reinvested to improve, for example, health sector and services, leading, consequently, to well-being. Furthermore, tourism sector contribute to improve wellbeing conditions thanks to its capacity to produce employment. Employment is a key word related to wellbeing concept. It contributes to make people "feel good", not only because of economic aspects, but because it let people be in relationship each other. In this perspective, tourism sector can play a key role in contributing to wellbeing, interpreted not only in its healthy dimension.</p>
<p>Goal 4. QUALITY EDUCATION - Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all</p> <p>A well-trained and skilful workforce is essential for tourism to thrive. Tourism sector can provide incentives to invest in educational and training for youth, women, peoples with special needs, etc.</p>
<p>Goal 5. GENDER EQUALITY - Achieve gender equality and empower all women and girls</p> <p>Being one of the areas with greater women employment, tourism can empower women and promotes gender equality creating new jobs and income-generating opportunities. This sector can help women to be engaged in every aspect of society.</p>
<p>Goal 6. CLEAN WATER AND SANITATION - Ensure availability and sustainable management of water and sanitation for all</p> <p>Tourism can play an important role in the field of hygiene and sanitation. A proper use of water, an efficient water management, an efficient aquifer pollution control in tourism sector can be very important for safeguarding this precious resource.</p>
<p>Goal 7. AFFORDABLE AND CLEAN ENERGY - Ensure access to affordable, reliable, sustainable and modern energy for all</p> <p>Tourism sector needs a lot of energy input and so, using renewable energy, it can helps to move towards renewable energy investing in sustainable energy resources. It can contribute to decrease the emission of polluting gases, improving environment.</p>

Goal 8. DECENT WORK AND ECONOMIC GROWTH - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Tourism is a very important resource for jobs: in fact, it provides for 1 in 11 jobs worldwide, giving people the access to decent work. Society benefits from increased skills and professional development. The importance of tourism to job is recognized in Target 8.9 "By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products".

Goal 9. INDUSTRY, INNOVATION AND INFRASTRUCTURE - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Tourism can also lead governments to improve their infrastructure and retrofit their industries, making them more clean and sustainable to attract tourists and foreign investment. This should also facilitate further sustainable industrialization, necessary for economic growth, development and innovation.

Goal 10. REDUCED INEQUALITIES - Reduce inequality within and among countries

Tourism can be an effective means for developing countries to take part in the global economy. This sector, by giving citizens the opportunity to thrive in their country and participate in its economy, can contribute to urban and rural development and reducing regional imbalances.

Goal 11. SUSTAINABLE CITIES AND COMMUNITIES - Make cities and human settlements inclusive, safe, resilient and sustainable

A city that is not good for its citizens is not good for tourists. Sustainable tourism can improve cities by promoting, for example, regeneration of degraded areas, conservation of cultural and natural heritage, investments in public services, improvement of green areas, etc., by improving residents' quality of lives, too.

Goal 12. RESPONSIBLE CONSUMPTION AND PRODUCTION - Ensure sustainable consumption and production patterns

If tourist sector adopts sustainable consumption and production practices, could strongly support the global effort/challenge to move towards sustainability. To do so, as set in Target 12.b of Goal 12, it is important to "Develop and implement tools to monitor sustainable development impacts for sustainable tourism which creates jobs, promotes local culture and products".

Goal 13. CLIMATE ACTION - Take urgent action to combat climate change and its impacts

Tourism contributes to and is affected by climate change. So, the sector is interested in playing a key role in the global effort to face climate change. By lowering energy consumption and shifting to renewable energy sources (facilitating for example the use of public transport), tourism can help to mitigate climate change.

Goal 14. LIFE BELOW WATER - Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Coastal and maritime tourism (tourism's biggest parts) is based on healthy marine ecosystems. Tourism plays an important role in coastal area. In these areas, marine ecosystems have to be preserved, in line with "Target 14.7: by 2030 increase the economic benefits to SIDS and LDCs from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism".

Goal 15. LIFE ON LAND - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Quality landscapes, rich biodiversity and natural heritage sites are often the main reasons for tourists to visit a specific destination. Sustainable tourism can play a key role in biodiversity and native flora and fauna conservation thanks to its efforts in reducing waste and consumption and awareness-raising activities.

Goal 16. PEACE, JUSTICE AND STRONG INSTITUTIONS - Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

As the tourism encourages meetings among people of diverse cultural backgrounds, it can promote multicultural and multiethnic tolerance, promoting a more peaceful world. Sustainable tourism strengthens the sense of belonging and stimulates entrepreneurial activities, thereby helping to prevent violence and conflict to take root and consolidate peace in post-conflict societies.

Goal 17. PARTNERSHIPS FOR THE GOALS - Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Tourism can support and strengthen public/public cooperation and public/private partnerships (engaging multiple stakeholders) in the achievement of the SDGs thanks to its cross-sectorial nature.

With particular reference to the achievement of the Goal 13 of SDGs (Climate action - Take urgent action to combat climate change and its impacts), the sector can play a key role in the global response to climate change. Sustainable tourism can create opportunities to support commitments towards low emissions and more efficient and less polluting operations.

Here below (Tab. 4) some relationships between climate change and tourism sector, as UNWTO and UNEP highlighted in "Climate Change and Tourism. Responding to Global Challenges" report (UNWTO and UNEP, 2008).

Tourism is responsible of about 5% of global CO₂ emissions and it contributes to 4.6% of global warming (www.unwto.org). The air transport and accommodation sectors are the major responsible for the emissions of greenhouse gas. The transport sector in general produces the largest amount of emission, equal to 75% (Tab. 5).

Air travel is considered the main tourism contributor to global warming (fig. 1): it is responsible for 40% of the total carbon emissions caused by this sector, and 54-75% of radiative forcing.

The accommodation sector accounts for about 20% of emissions from tourism because of using air-conditioning, heating, restaurants, etc. Clearly, it depends also from the type of hotels, size, location, etc. (UNWTO and UNEP, 2008).

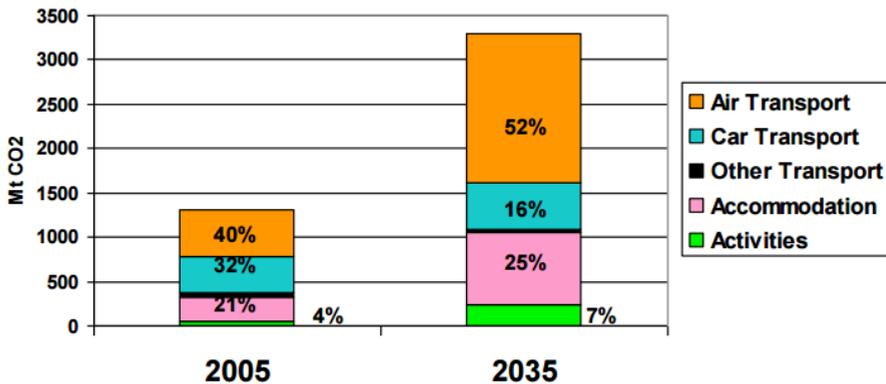
In order to support international agreements about global climate, in 2009 the World Travel & Tourism Council (WTTC) published "Leading the Challenge on Climate Change" highlighting actions required to achieve the reduction of carbon emission by 50% by 2035 based on 2005 levels (WTTC, 2009).

Table 4. Relationships between climate change and tourism sector.

Impact	Implications for tourism
Warmer temperatures	Altered seasonality, heat stress for tourists, cooling costs, changes in plant-wildlife-insect populations and distribution, infectious disease ranges
Decreasing snow cover and shrinking glaciers	Lack of snow in winter sport destinations, increased snow-making costs, shorter winter sports seasons, aesthetics of landscape reduced
Increasing frequency and intensity of extreme storms	Risk for tourism facilities, increased insurance costs/loss of insurability, business interruption costs
Reduced precipitation and increased evaporation in some regions	Water shortages, competition over water between tourism and other sectors, desertification, increased wildfires threatening infrastructure and affecting demand
Increased frequency of heavy precipitation in some regions	Flooding damage to historic architectural and cultural assets, damage to tourism infrastructure, altered seasonality
Sea level rise	Coastal erosion, loss of beach area, higher costs to protect and maintain waterfronts
Sea surface temperatures rise	Increased coral bleaching and marine resource and aesthetics degradation in dive and snorkel destinations
Changes in terrestrial and marine biodiversity	Loss of natural attractions and species from destinations, higher risk of diseases in tropical-subtropical countries
More frequent and larger forest fires	Loss of natural attractions; increase of flooding risk; damage to tourism infrastructure
Soil changes (e.g., moisture levels, erosion and acidity)	Loss of archaeological assets and other natural resources, with impacts on destination attractions

Source: "Climate Change and Tourism. Responding to Global Challenges" (UNWTO and UNEP, 2008).

Figure 1. Global percentage of CO2 emission per sector.



Source: UNWTO-UNEP-WMO 2008.

Table 5. Tourism emission: CO2 global emission in 2005.

Sub-Sector	CO2 (Mt)		
<i>Air transport</i>	522	40%	} Transportation of tourist = 75% of sector emissions
<i>Car transport</i>	418	32%	
<i>Other transport</i>	39	3%	
<i>Accommodation</i>	274	21%	
<i>Activities</i>	52	4%	
TOTAL	1307	100%	
Total World (IPCC 2007)	26400		
Tourism Contribution	5%		→ It does not include non-CO2 emissions and impact on climate.

Source: UNWTO and UNEP, 2008.

In 2010, WTTC published “Climate Change: A Joint Approach to Addressing Climate Change” outlining frameworks and partnerships to support the implementation of measures that reduce tourism’s greenhouse gas and increase tourism’s resilience (WTTC, 2010).

A massive diplomatic effort has been done in 2015 with the signing of the Paris Climate Agreement (L'accord de Paris) at the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) (United Nations, 2016).

The “Paris Agreement” is the key outcome of the Conference. It sets out an ambitious greenhouse gas emissions reduction pathway, but there is no explicit reference to emissions from international aviation and shipping. The long-term goal to achieve is to contain average warming below the 2 degrees Celsius limit. It also requires global commitment and collaboration.

During COP21, WTTC reported on progress in the “Travel & Tourism 2015; Connecting Global Climate Action” report (WTTC, 2015). It draws the following three conclusions:

- “Travel and tourism companies are 20% more carbon efficient today than they were in 2005;
- The sector is on course to cut its carbon emissions by 50% from 2005 to 2035;
- The sector is on course to reach the target of 25% reduction by 2020”.

During the 22nd Session of the UNFCCC Conference of Parties (COP22) (United Nation, 2016b) the role of tourism in implementing the Paris Agreement (COP21) has been discussed. In particular, the International Symposium of the Sustainable Tourism Programme of the United Nations - 10-Year Framework of Programmes on Sustainable Consumption and Production (10YFP) - has held with the aim to discuss about the role of Sustainable Tourism in a Changing Climate.

The Symposium brought together global tourism experts and aimed at increasing awareness on the relationship between tourism and climate change issues

and encouraging actions directed to reinforce national commitments to the Paris Agreement and the 2030 Sustainable Development Agenda. The event focused on the need of partnerships with private sector and the role of sustainable transportation to accelerate climate actions in tourism sector.

Climate change requires a shift towards sustainable consumption and production patterns from different actors (governments, communities, NGOs, etc.).

Tourism depends on transport sector and the demand referred to the tourism sector contributes to increase transport one.

Even if the majority tourists travel by car, air transports and cruises are the main responsible for greenhouse gas emissions (associated to tourism sector), particularly considering that most cruises start with a flight to the place of departure (and it produces and increase in total emissions from the cruises equal to 10-30%), cruising is the means of transportation producing more amount of greenhouse gas emissions per kilometre travelled

International air transport and maritime transport have contributed to drastically reduce distances. They also contributed to produce employment also because of the growth of trade and tourism.

The aviation sector and related tourism, for example, produce 63 million jobs (of which 9.9 million are straight referred to industry airlines (www.atag.org)).

The increase in number of EU passenger transport (estimated about 70% between 1995 and 2050) is

good for the economy but, at the same time, it represents a threat to the climate, environment and human health (pollution due to carbon dioxide (CO₂), nitrogen oxides (NO_x) and sulfur oxides (SO_x), but also noise pollution). It is estimated that air and maritime transport respectively will produce 22% and 17% of global CO₂ emissions in 2050 (European Parliament, 2015b).

Here below some data about global tourism emissions from air and ground transport, from international and domestic tourism (Tab. 6).

Population that takes actively part in aviation is about 2% and 80% of all flights are for holiday reasons: air travel is a very used means of transportation, above all for holiday trips. It is estimated that air travels will increase of 4.7% per annum until 2032 (Airbus, 2013); in this year it is estimated that there will be about 20,930 airplanes. Between 1990 and 2014 there has been an increase of 80% (considering a little stop during the economic crisis in 2008) of flights, also due to the growth in number of low-cost flights.

It is expected that fuel demand from aviation will increase at a rate of about

Table 6. Global tourism emissions.

Mode	CO ₂ factor (kg/pkm)
Air < 500 km	0.206
500-1,000 km	0.154
1,000-1,500 km	0.130
1,500-2,000 km	0.121
> 2,000 km	0.111
Air world average	0.129
Rail	0.027
Car	0.133
Coach	0.022

Source: "Climate Change and Tourism. Responding to Global Challenges" (UNWTO, 2008).

2% per annum until 2025 (Chèze et al., 2011). Obviously, the increase in air transport will produce, as a result, an increase of pollution, environmental noise, etc level (www.atag.org).

In 2015, the total number of passengers travelling by air in the European Union could be established at 918 million, an increase of 4.7% compared to 2014. Around 3.6 billion passengers were carried by the world's airlines (www.atag.org). In 2030, it is expected that Europe will have a number of international tourist arrivals of at least 90% of its population.

According to an ICAO study, each person travelling by plane (on a long-distance) produces the same pollution of a motorcyclist in two months (www.icao.int); furthermore, an intercontinental air travel (one way trip) from Paris to New York produce emissions as the amount produces from energy consumption of a house in ten days (381,58 kilograms of CO₂) (www.icao.int).

Another negative impact for people's health generated by the air traffic is the noise related to takeoffs and landings. A recent study (WHO, 2011) has demonstrated negative effects on academic performance for children exposed to aircraft noise.

The pollution level in 2014 has been similar to 2005 level. In 2014 emissions and noise exposure are a little reduced thanks to technological improvements, that is better efficiency in air traffic management (but also due to economic crisis in 2008).

In 2015, 566 Mt of CO₂ emissions have been produced by passenger. IATA's (2016) estimated this indicator (referred to the same year) about 781 Mt including also freight-related emissions.

Each average one-way journey in economy class produces 187 Kg of CO₂, while in premium class it produces 365 kg of CO₂ emissions; as a journey is normally there and back, these values have to be doubled.

The highest value of flights' emissions is, of course, in July and August, due to the increase in number of passenger for holidays.

Air transport represents a great challenge for reducing air pollution. Reducing air traffic is an unrealistic solution. Replacing the flights with more efficient engines is difficult, too. But, at the same time, today the use of alternative and sustainable fuels is going on very slowly.

Another means of transportation producing great amount of gas emissions is maritime transport. It is dependent on fossil fuels (fuel oil) and pollutes by oil, waste etc. in the sea, producing negative impacts not only for the environment.

Nowadays many people spend their holidays by cruise; there are very large ships carrying more than 1000 crew members and 5000 passengers. In 2014, 42 cruise lines were in Europe, operating 123 cruise ships (with a capacity of 146,000 lower berths). There were also 60 vessels (for around 89,000 lower berths) by 18 non-European lines.

The majority of cruise passengers visited Mediterranean, the Baltic and other European regions: 29 million passenger visits at a total of about 250 European port cities (a decrease of 7.1% referring to 2013) (CLIA, 2015).

"Cruise industry" has many economic impacts (CLIA, 2015), including:

- €40.2 billion in total output
- €16.6 billion in direct spending by cruise lines and their passengers and crew
- 348,930 jobs
- €10.75 billion in employee compensation
- These data include direct, indirect and induced impacts of the cruise industry.
- Furthermore each €1 million in direct cruise industry expenditures produces (CLIA, 2015):
- €2.42 million in business output
- 19 jobs paying an average annual wage of nearly €33,700.

Although it produces a lot of economic benefits, this sector also produces many negative impacts, above all on the environment, due to amounts of sewage, garbage, waste water and air pollutants. It is estimated that a large cruise ship produces per day emissions equal to 376m cars (Tab. 7).

Furthermore, because of many ports are not equipped to meet the electricity demand of ships, the latter need to keep their engine continuously working (also when they are moored) with negative consequences for the environment.

Air pollution due to international shipping is the cause of about 50,000 premature deaths per year in Europe (www.transportenvironment.org).

Some actions for reducing gas emissions, as the veto of dumping in sensitive marine areas and reduction of speed of navigation, are slowly taking place. Furthermore, it is searching for more sustainable fuels.

The costs to reduce pollutant emissions due to shipping are estimated to be between 0.4 and 4 euros per kg of SO₂ and from 0.01 to 0.6 per kg of NO_x (www.transportenvironment.org).

The reduction of air pollution from ships is very convenient. Up to 34 billion Euros “could be saved in health costs each year if the IMO (International Maritime Organization) fuel standards were transposed into the EU legislation” (www.transportenvironment.org).

But the adopted measures to reduce pollution are not sufficient, as also airline and maritime companies admit (www.eea.europa.eu).

As Galway-born Andrew Murphy (aviation specialist with the Brussels-based Transport & Environment lobby group) has highlighted, the UN goal of reducing global warming to between 1.5 and 2 degrees would be difficult to achieve without reducing emissions from international aviation and shipping.

Achieving the goal of the “Paris Agreement”, and thus to reduce global temperature to 2° C compared to pre-industrial level, requires necessarily the involvement of the air and maritime transport sectors.

Some European airports (113 airports) already dedicate themselves to reach this goal, participating in the Air-

Table 7. Per day emissions from a large cruise ship compared to the equivalent number of cars.

CO ₂	83 678 cars
NO _x	421 153 cars
Particle emissions	1.05m cars
Sulphur dioxide	376m cars

Source: The Guardian (www.theguardian.com).

port Carbon Accreditation program (www.airportco2.org). Besides, the EU is collaborating to research for aircraft engines less polluting.

In the same way, the International Maritime Organization is acting to reduce pollution through a lot of initiatives, as for example through the creation of a data collection program to improve information about pollution from shipping.

Starting from 2018, each ship over 500 tons using ports will have to submit their amount of their CO₂ emissions, in order to monitor the amount of CO₂ produced by ships during the travel or when they are in port. This might reduce by 2% their CO₂ emissions during travelling. Furthermore, European Parliament has proposed the use of alternative fuel for shipping.

The need for alternative fuels has been recently discussed. Considerable progress has been made in increasing fuel efficiency of aircraft. A good solution may be hydrogen powered aircrafts, but Boeing and Airbus have not yet developed it because currently available biofuels cannot be used in aviation, excepting in a very low mix ratio with jet fuel.

Aviation fuels have to remain in a liquid state at low temperatures, and also have high energy content by volume, but current biofuels do not satisfy these requirements well (UNTWO and UNEP, 2008).

More actions about air traffic management (as to fly at optimal altitudes and speeds, and to reduce time spent waiting to land), technology, green businesses and monitoring are required. However, the technological research for reducing negative impacts in the air transport sector has not kept pace with the increased demand and the road is still long.

The tourism sector cannot be excluded from the global climate change facing. It needs to be more transparent and do not forget the close relationship between tourism and global warming.

The specific database about emissions related to transport sector referred to tourism date back to 2008 with the UNWTO report. It provided data for a base-line year of 2005. It needs to update these data to better understand the current impacts and trends in recent years in order to accurately address actions to make tourism more sustainable. Surely, one of the major challenges lies in increase fuel efficiency and sustainability.

Consistent and transparent data about carbon emissions from tourism sector are fundamental to move towards a more sustainable tourism. It is highlighted also in the Paris Agreement (UN, 2016, art. 13.1, p. 28) that established an "enhanced transparency framework" to "build mutual trust and confidence and promote effective implementation".

Furthermore, it needs a specific evaluation about greenhouse emissions related to tourism sectors considering that the latest assessment dating back to 2005 (Scott et al., 2008; 2016).

The Paris Agreement (UN, 2016, art. 7.1, p. 25) required the engagement of each signatory in the adaptation planning actions and implementation of reports about evaluation of actions. However, it lacks of specific information on how to assess and track these actions in order to evaluate their effectiveness (Ford et al., 2015; Magnan, 2016).

Strategies to transform tourism sector to a low carbon economy and improve the awareness about the relationship between this sector and climate change and risks are required. In this perspective, collaboration among public and private sectors, research community and other decision-makers are fundamental in order to strengthen the tourism sector contribution to the challenge of climate change.

5. The circular economy and tourism

5.1 *A new development/management model for tourism sector*

Tourism sector has the capacity to link economic, social, cultural and environmental dimensions of sustainability and to contribute to their mutual improvement. The reason is that tourism is an economic activity strictly depending on the presence of environments, cultures and communities (the opportunity of tourism sector to deliver income and jobs from cultural experiences is just one example). In turn, this puts tourism sector at the heart of the challenge to social, cultural and environmental impacts.

Tourism sector, as well as other sectors, has been affected by the economic crisis; nevertheless, it has not fallen sharply as other sectors. However, it goes through transformations. In fact, the economic crisis has given rise, for example, to new tourism models.

Sustainable tourism is a concept applicable to all form of tourism (mass and niche tourism) and to all destinations. In order to be a sustainable sector, tourism needs to transform its processes from linear (take-make-dispose) to circular (take-make-use-remake) ones.

The circular economy is defined as “restructuring the industrial systems to support ecosystems through the adoption of methods to maximize the efficient use of resources by recycling and minimizing emissions and waste” (Preston, 2012).

Thanks to circular processes, inputs are minimized and, at the same time, outputs are maximized, preserving as long as possible the value of the produced resources (Preston, 2012). It is more efficient and productive than traditional linear economy.

Circular economy is not only referred to waste cycle (European Commission, 2015), but it is the economy of synergies and symbiosis among different industrial activities, city and industrial system, etc. It is the re-generative economy of materials, but also of natural, cultural and social resources, energy, water, etc. In this perspective, it needs to consider not only actors individually, but all relationships among them, too. The circular model (Ellen MacArthur Foundation, 2015), based on the principle that in nature nothing is “waste” and everything can become a “resource”, can be used to operationalize sustainable development principles. It stresses the importance of closing loops.

The logic of circular economy (Angrisano et al., 2017) can be transferred from the industrial field (Industrial ecology) to the tourism sector through the imple-

mentation of business models based on sustainable principles. The circular model can help to make tourism more sustainable.

Sustainable tourism can be referred to different aspects of tourism sector: transportation, eco-friendly consumers and producers behaviour, respect of local culture, hotel industry, gastronomy, accommodation, adaptive re-use, knowledge flows.

Often the concept of circular economy associated to tourism sector is essentially related to goods and services production without wasting and to the using of sharing platforms (i.e. Airbnb).

The latter are part of the sharing economy that is different from the circular one. The sharing economy is an economic model based on a set of exchange and sharing practices, both material goods and services and knowledge. It refers to the sharing of goods or other resources by multiple people. The circular economy aims to close the loops. In this model nothing is waste: it is opposite to linear economy. The sharing economy changes the ownership's characteristics of goods, while the circular economy refers to the life cycle of goods, aiming to make it more efficient.

These two economic models are not synonyms, but they can be related; they can be integrated; they are different, but they can be complementary. The circular economy is referred to the lifespan of the goods. The sharing economy is referred to a way in which they can be used during their lifespan.

The sharing economy, referred to the collaborative consumption, represents one of the various business models able to drive the circular economy and thus contribute to make tourism sustainable.

In order to support the take-make-use-remake system, the ownership of materials is changing and producers are transforming their behaviour (i.e. leasing and sharing of durable goods).

The sharing economy is surely a way that helps to make tourism sector more sustainable. For example, the use of "airbnb" platform allows savings resource compared to hotels. In fact, "sharing leads to 0-30% less waste, 50% less water, 80% less energy, 90% less CO₂ than European hotels" (ten Wolde, 2016).

As above mentioned, often the circular tourism is defined as a model able to create a virtuous circle producing "good and services without wasting the limited resources of the planet that are the raw materials, water and energy" (www.circular-tourism.com), that is limiting impact on environment, and in which actors of tourism (traveller, host, tour operator, supplier) adopt an eco-friendly and responsible approach. It is true, but it is just an aspect of circular tourism.

5.2 *Circular tourism*

By applying principles of circular economy, hospitality and tourism companies can contribute to the achievement of sustainable tourism. Hospitality industry (hotels and other accommodation facilities) are strictly engaged in sustainable initiatives, so they should implement and increase sustainability measure. However, often these ac-

tions are considered only to achieve economic advantages. So the majority of these initiatives are mainly related to energy and water consumption and waste reduction, while environmental and socio-cultural issues are rarely considered.

According to Responsible Travel reports, the most popular Italian tourist destinations are striving to reduce CO₂ emissions through actions related to waste, recycling policies, energy conservation and use of environmentally friendly materials. In some locations, as for example in the Dolomites, they are trying to promote natural gas or electric buses and the restaurants tend to propose “zero km menu”.

The “zero km menu” is very important for the regional economy: facilities, offering food and local products, encourage local economy and the work of small local companies.

Several the four and five star hotels are active in approaches environmental-friendly (as energy-related measure), as these yielded the greatest cost-savings (van Rheede, 2012). However, many researches underline that saving energy helps the environment and, at the same time, helps reduce costs. Leisure farm hotel (Hungary) is an example of facilities that is based on the principle “Waste = Money”. Here, visitors can pay part of their entrance fee with reusable waste (plastic, aluminium bottle, paper). It has awarded the European Business Awards for the Environment Winner 2016-2017.

An example of applying the principles of the Circular Economy is the Dutch Hospitality in Netherlands (Green Recycled Organics - GRO). It is focusing on up-cycling used coffee grounds to high value food products. In particular, it uses coffee grounds of hotels and restaurants as organic source for the oyster mushroom production (van Rheede, 2012). The produced mushrooms are harvested and then they return (after 6 weeks) to the restaurants to be used. This concept aims to optimize the logistics and supply chain and to minimize additional transports.

In a circular perspective, waste produces by tourism sector can become part of the city system and thus part of the urban processes in order to optimize resources and make tourism more sustainable.

In built environment there is a great potential for saving energy. The investments pay back well during life cycle of the goods. Energy saving can be achieved through investments in technologies (such as renewable energy systems, energy efficient lighting, cooling, heating) but also through territorial management and behavioural and lifestyle changes. These circularizations are not specific only for tourism sector, but they can be applied to tourism industry, contributing to make it more sustainable. For example, good retrofits of existing buildings can decrease the energy consumption of 50-90%.

Circular tourism sector is referred to its capacity to trigger and stimulate circular flows, aiming to conciliate tourism sector and sustainable resource management. But, that's not all. Circular tourism is not only a green tourism, addressed to limit the consumption and waste of non-renewable energy sources.

Recovery, reuse, redevelopment, but also valorization and regeneration are key words if we think about sustainable and circular tourism. The future of tourism goes almost always through the protection of cultural and natural heritage in order to achieve a sustainable touristic supply.

Heritage reuse can contribute to revitalize local economy with jobs, new businesses, tax revenues and local spending, to provide valuable wildlife habitat and recreational amenities, as well as to regenerate values.

We can “use” tourism as a mean to regenerate knowledge produced by each territory (in terms of values, language, significance, skills). The functional reuse is not only refers to the fixed capital, but also to knowledge, values. In this perspective, circular tourism represents a mean to fix the memory in the era of “instant”, of the “hic et nunc”. Through functional re-use, we are able to regenerate values, keeping them in time.

In the cultural heritage/landscape perspective, the adaptive re-use is a way to transform principles of circular economy into practice. In fact, it allows reducing the use of materials, of new land and building, to regenerate existing goods through new functions, to maintenance keeping them “alive”. Maintenance, reuse, restoration, rehabilitation, etc. are improved through circular processes.

The circular economy allows conserving the use-value of heritage, through the regeneration of resources, and intrinsic one. The adaptive reuse produces multidimensional benefits: cultural benefits (conserving “alive” a symbol of community identity), economic benefits (in terms of increase of productivity), environmental benefits (i.e. reduction of resource consumption) and social benefits (i.e. employment).

Circular tourism sector is also referred to its capacity to trigger and stimulate circular economic flows. For example, the functioning of tourist demand and supply causes a flow of personal income from a country to another one, without conventions or formal procedures.

Mechanisms of tourist supply and demand allow exporting “material and immaterial values”, without trade or other mechanisms. The exportation of intangible values is very significant in tourism sector. It doesn’t require “to be packed” or particular trade procedures as other goods and services. The “invisible exportation and importation” (Vujovic et al., 2016) make tourism sector more advantageous compared to other sectors in some ways.

Foreign tourists’ expenditure has direct impacts on the overflow of national income; it creates a flow among the countries of origin and countries in which tourists come and spend. Incomes from foreign tourism represent a causal correlation among tourism and real economic growth.

Incomes and expenses related to tourism sector are referred, for example, to incomes produced through the exportation of goods and services, incomes generated through the sale of goods and services to foreign tourists, incomes from investments in foreign tourist economies, then incomes from taxes paid by foreign tourists.

In economic terms, tourism can be considered a traded service, an export and import sector: money earned by destination countries represents the exportation and money spent by visitors represents the importation.

Tourism exports represent 6% of overall exports (goods and services) and 29% of world’s exports of commercial services (UNWTO, 2014). International tourism is one of the world’s major trade categories after fuels, chemicals, food and au-

tomotive products. For a lot of developing countries, international tourism represents the main source of foreign investment, producing new jobs and business opportunities.

Tourism sector is able to produce employment not only in the sector itself, but also in other ones (complex value chain). For example, tourists at destination move by local transportation, taste the local gastronomy and wines, buy local product, etc. Furthermore, accommodation facilities require suppliers in different areas, as furniture, electronic equipment, etc.

These relationships are very important for all economies, especially in countries where tourism produce a demand for specific products otherwise without demand.

Especially if tourism sector represents the economy driver of a country, in order to not turn it in a treat for environment, community, etc., it is necessary to organize and manage it according to circular processes, strengthening relationships, bonds and synergies. To this end, an adequate legislation framework and regulation on investment are necessary. Furthermore, in order to direct tourism development/management strategies, the evaluation of local touristic potential is necessary.

Inadequate knowledge of the territory and of tourism demand and supply can badly direct development policies, producing negative impacts on the environment, economic activities, local culture and community (i.e. pollution, degradation, congestion of public spaces, inflationary processes both in commercial services and in the real estate market).

These relationships and thus the multidimensional impacts of tourism sector require adequate evaluation and monitoring tools, through appropriate indicators. A deep knowledge of data is necessary to undertake actions to reduce negative impacts of tourism sector. Achieving sustainable and circular tourism is a continuous process; it requires constant monitoring of impacts and a wide awareness of them (both positive and negative), contributing to assume behaviours able to make tourism a mean to achieve sustainable development goals.

6. Conclusions and research perspectives

In conclusion, tourism sector can represent a threat (because of its negative impacts) but, at the same time, a starting point in the achievement of sustainable development.

In this perspective, tourism sector requires the definition of new development/management strategies of resources. In this paper, the circular economy is proposed as a model to operationalize sustainable principles.

Globally, circular economy is mainly referred to waste cycle management (Ghisellini et al., 2015). But, as above mentioned, this approach should be overcome and transferred from a sectorial approach (waste management) to the comprehensive city organization, its economy, its social system, its governance (Fusco Girard, 2014) in order to improve urban productivity.

This model can be transferred, for example, to agriculture, real estate, tourism sector. In particular, this paper has been focused on the circular economy applied to the tourism sector.

The circular tourism requires appropriate tools, indicators, knowledge and data in order to assess/monitor the performances of this new model, that is the efficiency of the circular model.

Conflicts between short-term and long-term impacts, between benefits for tourists and for residents, between use values and non-use values characterize tourism.

The conflict between tourists' interests and residents' ones is evident. An open research perspective is, in particular, related to indicators able to express the synergic relationship between the quality of touristic resources and community health and wellbeing.

The impacts on health and wellbeing are simultaneously beneficial to residents and tourists (in a circular perspective). This represents a rich field of research to be explored in order to analyse/give empirical evidence to the contribution of tourism sector to sustainable development, reducing risks of negative impacts that are determining the climate change.

References

- Airbus (2013). *Future Journeys 2013-2032*. www.airbusgroup.com
- Angrisano M., Biancamano P., Bosone M., Carone P., Daldanise G., De Rosa F., Franciosa A., Gragnuolo A., Iodice S., Nocca F., Onesti A., Panaro S., Ragozino S., Sannicandro V., Fusco Girard L. (2016). Towards operationalizing UNESCO Recommendations on "Historic Urban Landscape". *Aestimum* 69: 165-210.
- Chertow M.R. (2000). Industrial symbiosis: Literature and taxonomy. *Annual Review of Energy and the Environment* 25: 313-337.
- CLIA Cruise Lines International Association (2015). *The cruise industry. Contribution of Cruise Tourism to the Economies of Europe*. www.cruising.org
- Edgell D.L. (2006). *Managing Sustainable Tourism: A Legacy for the Future*. The Haworth Hospitality Press, New York.
- Ellen MacArthur Foundation (2015). *Growth within: a circular economy vision for a competitive Europe*. www.ellenmacarthurfoundation.org
- European Commission (2015a). *Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions. Closing the loop - An EU action plan for the Circular Economy*. Brussels, 2.12.2015 COM(2015) 614 final.
- European Commission (2015b). *Getting cultural heritage to work for Europe. Report of the Horizon 2020 expert group on cultural heritage*. http://ec.europa.eu/culture/news/2015/0427-heritage-2020_en
- European Parliament (2015a). *Tourism and the European Union - Recent trends and policy developments* (Author: Maria Juul Members' Research Service). September 2015 — PE 568.343
- European Parliament (2015b). *Emission Reduction Targets for International Aviation and Shipping*. This document is available on the Internet at: www.europarl.europa.eu/studies
- Ford J.D., Berrang-Ford L., Biesbroek R., Araos M., Austin S.E., Lesnikowski A. (2015). Adaptation tracking for a post-2015 climate agreement. *Nature Climate Change*, 5: 967-969.
- Fusco Girard L. (2014). The role of cultural urban landscape towards a new urban economics: new structural assets for increasing economic productivity through hybrid processes. *Housing Policies and Urban Economics* 1(1): 3-27.

- Fusco Girard L., Angrisano M., Bosone M., Gravagnuolo A., Nocca F. (2015). Towards an economic impact assessment framework for Historic Urban Landscape conservation and regeneration projects. *BDC - Bollettino del Centro Calza Bini* 15(2): 1-29.
- Fusco Girard L., Nijkamp P. (2009). *Cultural Tourism and Sustainable Local Development*. Ashgate.
- Ghisellini P., Cialani C., Ulgiati S. (2015). A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production* 114: 11-32. doi: 10.1016/j.jclepro.2015.09.007.
- Magnan A.K. (2016). Climate change: Metrics needed to track adaptation. *Nature* 530: 160.
- Preston F. (2012). A Global Redesign? Shaping the Circular Economy. *Energy, Environment and Resource Governance*, n. 2, Chatham House, London.
- Scott D., Peeters P., Gossling S. (2010). Can tourism deliver its "aspirational" emission reduction targets? *Journal of Sustainable Tourism* 18: 393-408.
- Scott D., Hall M.C., Gossling S. (2016). A report on the Paris Climate Change Agreement and its implications for tourism: why we will always have Paris. *Journal of Sustainable Tourism* May 2016 24(7): 933-948. doi: 10.1080/09669582.2016.1187623
- Ten Wolde A. (2016). *Circular Tourism*. International Conference Green and accessible tourism Split, Croatia, 4 November 2016.
- United Nations (2016a). *United Nations treaty collection chapter XXVII environment, Paris Agreement*, Paris, 12 December 2015. New York, United Nations https://treaties.un.org/pages/Treaties.aspx?id=27&subid=A&clang=_en
- United Nation (2016b). *Marrakech action proclamation for our climate and sustainable development*. United Nations Climate Change Conference (COP 22). 7-18 November, 2016. Marrakech, Morocco.
- United Nations (2016c). *Draft outcome document of the United Nations Conference on Housing and Sustainable Urban Development (Habitat III)*. Quito, Ecuador. 17 - 20 October 2016.
- United Nations (2016d). *Report of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators*. Statistical Commission Forty-seventh session. 8-11 March 2016.
- United Nations (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*. Resolution adopted by the General Assembly on 25 September 2015. www.sustainabledevelopment.un.org
- United Nation (2012). *Future We Want - Outcome document*. United Nations Conference on Sustainable Development (Rio+20). Rio de Janeiro, Brazil. 20-22 June 2012.
- United Nations World Tourism Organization (UNWTO) (2016a). Tourism highlights. <http://www.e-unwto.org/doi/pdf/10.18111/9789284418145>
- United Nations World Tourism Organization (UNWTO) (2016b). *Sustainable development of tourism. Climate change & tourism*. <http://sdt.unwto.org/en/content/climate-change-tourism>
- United Nations World Tourism Organization (UNWTO) (2015). *UNWTO tourism highlights 2015 edition*. Madrid, Spain.
- United Nations World Tourism Organization (UNWTO) (2014). *Annual Report 2014*. www2.unwto.org
- United Nations World Tourism Organization (UNWTO) (2013). *Sustainable Tourism for development. Guidebook - Enhancing capacities for Sustainable Tourism for development in developing countries*. <http://icr.unwto.org/content/guidebook-sustainable-tourism-development>
- United Nations World Tourism Organization UNWTO (2008). *International Recommendations for Tourism Statistics 2008*. Department of Economic and Social Affairs. Statistics Division. Series M No. 83/Rev.1
- United Nations World Tourism Organization (UNWTO) (1998). *Guide for Local Authorities on Developing Sustainable Tourism*. www.e-unwto.org
- United Nations World Tourism Organization (UNWTO) and Netherlands Development Organization (SNV) (2010). *Manual on Tourism and Poverty Alleviation: Practical Steps for Destinations*. World Tourism Organization, Madrid, Spain.
- United Nation World Tourism Organization UNWTO and United Nations Environment Programme UNEP (2008). *Climate Change and Tourism. Responding to Global Challenges*. World Tourism Organization, Madrid, Spain.

- United Nations World Tourism Organization (UNWTO) and United Nations Environment Programme (UNEP) (2005). *Making Tourism More Sustainable – A Guide for Policy Makers*. Paris, France
- van Rheede A. (2012). Circular Economy as an Accelerator for Sustainable Experiences in the Hospitality and Tourism Industry. <https://www.academia.edu/>
- Vujovic S.M., Ćurčić N. V., Miletić V. S. (2016). The influence of tourism on the circular flow of an economic process. *Economics of Agriculture* 1: 323-337.
- World Travel and Tourism Council WTTC (2017). *Travel & tourism: economic impact 2017*. www.wttc.org
- World Travel and Tourism Council (WTTC) (2015a). *Travel & tourism 2015. Connecting global climate action. Executive summary*. London, England.
- World Travel and Tourism Council (WTTC). (2015b). *Global travel & tourism 2015. Connecting global climate action*. www.wttc.org
- World Travel and Tourism Council (WTTC) (2015c). *Environmental, social & governance reporting in travel & tourism: Trends, outlook and guidance*. London, England.
- World Health Organization (WHO/Europe) (2011). *Burden of disease from environmental noise. Quantification of healthy life years lost in Europe*. www.euro.who.int ISBN 978 92 890 0229 5
- World Travel & Tourism Council (WTTC) (2010). *Climate Change A Joint Approach to Addressing the Challenge*. www.tourism-generis.com
- World Travel and Tourism Council (WTTC) (2009). *Leading the challenge on climate change*. London, England. www.cisl.cam.ac.uk

Sitography

www.airportco2.org
www.atag.org/
www.circular-tourism.com
www.eea.europa.eu
www.icao.int
www.theguardian.com
www.transportenvironment.org
www.transportenvironment.org
www.unwto.org