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Food Security is a major global issue, a fundamental human right and is essential to live a safe and healthy life: "Everyone has the right to a standard of living adequate for the health and well-being of oneself and of one’s family, including food" (Declaration of Human Rights, Article 25, paragraph 1). Achieving food security for all, now and into the future, was embedded in the Sustainable Development Goals adopted by more than 150 world leaders at the United Nations Sustainable Development Summit on 25 September 2015.

Food security is defined by the Food and Agriculture Organization as: when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food Sovereignty, conversely, was defined by the Asian Civil Society Organisation in 2004 as “…the right of people and communities to decide and implement their agricultural and food policies and strategies for sustainable production and distribution of food. Food Sovereignty is the right to adequate, safe, nutritional and culturally appropriate food and the ability to produce food sustainably and ecologically. It is the right to access of productive resources such as land, water, seeds and biodiversity for sustainable utilization”. Without sovereignty over food and agriculture, citizens are unable to express their opinions on the policies and decisions that affect their lives and future opportunities.

Global Context

The world population is predicted to grow from 6.9 billion in 2010 to 8.3 billion in 2030 and to 9.1 billion in 2050. By 2030, food demand is predicted to increase by 50% (70% by 2050). In 2015, 795 million people across the world did not get enough food to lead a normal, active life. This translates to one in nine of the world’s population going to bed hungry every night, despite it costing as little as approximately 25 cents to feed a hungry child. Hunger and hidden hunger (micronutrient deficiencies) deprive people of the most valuable resource they own: the energy and skill to work productively. Children are the most common victims of this invisible epidemic, with many dying from common infections like measles and diarrhoea because they are deprived of the right nutrition. In fact, poor nutrition is the underlying cause in nearly half (45%) of all deaths of children under five years old – 3.1 million children each year.

According to the United Nations 2014 Human Development Report, whilst food security is a complex sustainable development issue, lack of food and water security is not an issue of production or availability, but one of access and distribution. Every year around the globe 1.3 billion tonnes of food is lost or wasted, that is 1/3 of all food produced for human consumption. Food losses represent a waste of labour, water, energy, land and other inputs that went into producing that food as well as increasing greenhouse gas emissions in vain.

Progress towards food security and nutrition targets requires that food is available, accessible, prepared safely and of sufficient quantity and quality to ensure good nutritional outcomes. Proper nutrition contributes to human development; it helps people realise their full potential and take advantage of opportunities.
offered by the development process.

The share of undernourished people in the population, or the prevalence of undernourishment, has decreased from 18.6 per cent in 1990–92 to 10.9% in 2014–16, reflecting fewer undernourished people in a growing global population. Since 1990–92, the number of undernourished people has declined by 216 million globally, a reduction of 21.4%, notwithstanding a 1.9 billion increase in total population over the same period. The vast majority of the hungry live in the developing regions, where an estimated 780 million people were undernourished in 2014–16. Some regions have made remarkably rapid progress in reducing hunger, notably the Caucasus and Central Asia, Eastern Asia, Latin America and Northern Africa. Southern Asia and sub-Saharan Africa, progress has been slow overall with just under one in every four people, or 23.2% of the population, estimated to be undernourished, in 2014–16.

Figure 2: World Hunger Map 2015, World Food Programme

Across the developing world, the majority of the poor and most of the hungry live in rural areas, where family farming and smallholder agriculture is a prevailing – albeit not universal – mode of farm organisation. Growth in family farming and smallholder agriculture, through labour and land productivity increases, has significant positive effects on the livelihoods of the poor through increases in food availability and income.

Caritas Australia, is an integrated development agency with significant experience in sustainable agriculture and promoting the principles of food sovereignty and works to “end poverty, promote justice and uphold dignity”. Caritas Australia recognises the right to food as foundational to sustainable development and our approach draws upon several principles of Catholic Social Teaching including human dignity, solidarity, partnership, the common good and stewardship of the world’s resources. With our partners, we work to ensure that farmers, families and communities are at the centre of the decision making process. Caritas’ approach to food security ranges from providing food aid in times of crisis to longer-term programmes, improving small-scale agriculture, crop and horticultural production and diversification, livestock breeding, infrastructure, fish farming, soil improvement, integrated pest and water management, agroforestry and reforestation. Caritas also promotes civic participation and advocacy on social and economic issues such as access to markets, nutrition, water and sanitation for vulnerable communities.

Case Study 1: Fiji

Fiji has a Human Development Ranking (HDI) of 90 (out of 188 countries) and approximately 30% of the population lives below the national poverty line. It is estimated that about 140,000 people, or 17% of Fiji’s population, live in one of more than 180 squatter or informal settlements where they are extremely vulnerable to food insecurity and lack of food sovereignty. Taveuni is the third largest island in Fiji and is fondly referred to as the Garden Island. This is because of its rich and abundant vegetation and rural nature in which the majority of the population live off the land. For more than 30 years, the Tutu Training Centre in Taveuni, supported by Caritas, has provided rural adult vocational education that empowers local men and women to establish themselves as self-reliant farmers and income generators using their own land and resources for self-employment. Couples study household management, health and nutrition, and develop income-generating activities. Young farmers learn to move from subsistence farming towards commercial enterprise.

At Tutu, young farmers are trained on a 1,200 acre (approx. 500 hectares) training farm run by the centre and the program runs on a work-for-study basis. Fees and meal costs are waived in return for working on the farm. Over four years, participants farm crops on land at Tutu and their own village land, committing all profits towards a dedicated home savings scheme. The Centre teaches farmers to move from subsistence farming towards commercial enterprise including agriculture and animal husbandry. It also encourages young farmers to focus on the benefits of agriculture for healthy living as well as income generation by integrating simple techniques to grow local fruit and vegetables. One such technique involves using the local ‘mukuna’ bean - a small seed which looks
like a jelly bean, and planting this in less fertile soil and allowing the bean to grow as foliage across the soil. The mukuna bean can grow in this soil and in so doing, rehabilitates the soil with nutrients required for planting fruits and vegetables.

Many families in Taveuni focus on growing crops for income such as yaqona (kava) and dalo, and often plant on the best soil available. This means many local fruits and vegetables are not being grown for food and instead, “western” foods such as rice and sugar are being purchased from shops with this newly acquired income. Another key issue in the small rural island of Taveuni is the occurrence of disastrous cyclones that result in the destruction of planted crops. This situation is not expected to improve because one of the consequences of climate change is an increase in cyclones. Yaqona takes 4 years to grow and can easily be destroyed in difficult environmental conditions. Similarly, dalo, a root crop, can easily be destroyed by flooding and heavy cyclonic rain, resulting in large areas of crops being devastated.

An agricultural practice being promoted at the Centre is to encourage the pre-germination of seeds and the use of nurseries to ensure that crops such as yaqona (kava) and dalo are strengthened before being planted directly into soil. This method allows the root systems to have time to strengthen thus making the plants more resistant to the heavy cyclonic winds. At the same time, the use of a greenhouse means that younger plants can be stored safely, to be planted in the event of a cyclone destroying planted crops. Breadfruit - a sturdy vegetable grown on trees, is also being promoted as a cyclone resistant crop which is critical in providing food security in the event that existing crops are destroyed during natural disasters. The Centre is teaching young farmers and rural families propagation methods that allows the Breadfruit to grow at a lower height and develop better root systems, to withstand heavy winds and rain.

The Tutu Rural Training Centre also runs a six month Women’s course during which participants learn personal life skills as well as income generating activities such as jewellery making. Late last year, 35 young farmers graduated from their 4 year course and are now using these important techniques back in their communities. They also play a critical role in mentoring other young farmers and in encouraging and supporting them to improve their livelihoods through agriculture. So far, thousands of people have received training at Tutu and are using their skills to create better health and futures for their families. The outcomes of this project are aligned with Caritas’ vision that good development occurs when a community of people work together to break the cycle of poverty and dependence so that their fundamental needs are met and the quality of their lives is enhanced.

Case Study: Nepal

Nepal’s short growing seasons and mountainous terrain restrict the agricultural capacity for the majority of the population, particularly in the north west of the country. Access to land, particularly arable land, remains an ongoing issue which requires innovative farming techniques, optimisation of cropping while geographic remoteness limits access to fertilisers. More than 80 per cent of the Nepalese population are involved in the agricultural industry, have small land holdings based on subsistence farming and experience long dry seasons and inconsistent yields. Nepal has a Human Development ranking of 144, 30% of the population is food insecure and 47% of the population remains below the minimum nutritional requirement. Poverty among rural small farmer households is much greater than the national poverty average, with local estimates suggesting malnutrition affects as many as 60%. Serious malnutrition is seen in 50% of all children.

Approximately 3.8 million people in Nepal face food insecurity compounded by a combination of food price fluctuations and political and civil tension. Very low rice yields, particularly in the northwest of Nepal combined with India’s restriction on the export of non-basmati rice, on which Nepal is particularly reliant, has had significant impacts on supply and has increased prices of rice, the traditional Nepali staple.
For almost 12 years, Caritas Australia, along with 23 partner organisations, has supported Caritas Nepal to implement a Capacity Building and Extension Program for Pest Management in rice and vegetables. This project improves the sustainability of farming practices and household food security for more than 6500 small-scale farmers in sixteen food insecure districts throughout Nepal. In the initial phase of the program 30 extension officers were trained in the skills of Integrated Pest Management (IPM), they then passed these skills onto villages and communities at the local level. This included developing strategies for maintaining friendly insect and harmful pest balance, use of local organic resources (e.g., compost, animal urine, botanical mixtures) for pest and disease control, biological control and mechanical control. It also includes cultivation issues such as seed, nursery, land preparation, transplantation, other cultivation practices (such as rice intensification), irrigation, organic fertiliser use, and judicial use of chemical fertiliser (to avoid overuse and dependence on chemical-based alternatives). The extension officers conduct Farmer Field Schools where a curriculum developed in conjunction with the UN Food and Agricultural organisation is implemented. Farmers work in smaller groups (5-6 people) to manage their trial plots and report to larger group of 25 to 30 people. Farmer Field school activities are held for one day a week during the whole of the cropping season (18-22 weeks for monsoon rice) so farmers learn about managing crops during all stages of plant growth. An increase in crop yields in the range of 32% to 81% has been witnessed with farmers producing 115kg more rice. This translates to around 65 days more food. Farmer Field Schools aim to empower small farmers to adopt IPM and realise greater crop yields, household food security and farm sustainability as well as ensuring the farm environment remains ecologically sustainable for crop production.

Caritas Nepal and Caritas Australia also support farmers to increase their incomes by forming a Farmer Cooperative - pooling their labour and sharing profits from their vegetable sales. The farmers’ cooperative provides savings facilities and loans to members, who are otherwise unable to access financial services. In addition, farmers now have surplus funds that can be directed towards education in social issues such as trafficking of women and children. Participating Nepalese communities have the financial resilience to also divert surplus funds to address environmental issues such as tree planting programs.

The participatory nature of this program encourages decision-making, confidence and capacity-building within the community as well as ensuring that participants gain the skills necessary to implement the farming techniques. It also allows the skills learnt to be passed on and replicated by other community members, and other villages. The project recognises the importance that women play in the agricultural process in Nepal and hence has a strong focus on including women and girls throughout the training process and as trainers themselves. Women and girls contribute significantly to agricultural activities (more than 50% of workload). However in the past, their access to training in agriculture has been much less compared to men. Increasing the productivity of women’s farming activities transforms their decision-making status in families and results in improved strategic choices by the family, improved food security and reduced poverty for small farmer households. The Farmer Field Schools are also a strong platform to advocate for farmer rights, including accessibility to land, right to use water and seed rights. Seed is an important factor for incremental production and crop productivity.

The transformative impact of Caritas’ food security programs is summed up by Kaluram, who lives and farms on a small piece of land in Nepal’s south west plains:

“For my family there have been so many changes. We are not dependent on others for income now. We have no need to take loans for school fees. We’re producing more vegetables and rice to eat and also sell. Last year I started to lease land for growing rice and wheat to sell at the markets”.

Figure 4: Photo Credit, Caritas Australia
Conclusion

The Fijian and Nepalese case studies illustrate how small and simple changes in agricultural practices by subsistence farmers can lead to significant increases in yields of rice and vegetables. The increase in crop yields has substantially improved small farmers’ household food grain (rice) security and nutrition (vegetables) security. As such, the Farmer Field Schools, Integrated Pest Management practices and the cooperatives have become effective models of participatory development. The experience of countries that have succeeded in reducing hunger and malnutrition demonstrates that economic growth originating in agriculture, in particular among small farmers, is at least twice as effective in benefiting the poorest as growth from non-agriculture sectors. Ensuring food security for all is part of Caritas’ vision of a world where human well-being and dignity are paramount.

Student Activities


Use the “Topic” filter: “Food” to locate the resource.

2. Using a digital planning tool, such as bubble.us (https://bubbl.us/), create a mind map identifying the main causes of food insecurity and any inter-connections between these causes. Discuss how each of these factors may affect availability, accessibility and use of food.

3. Compare and contrast the 1996 World Food Summit definition of “Food Security” and the 2004 Asian Civil Society Organization’s definition of “Food Sovereignty”. What challenges do each pose?


What trends do you notice in the data?

5. Use the National Geographic Mapmaker to complete a Choropleth map: http://mapmaker.nationalgeographic.org/#/

Note: Go to p24 -26 “Secondary Food For All” workbook for the activity template.

6. Why do so many people in our world not have access to the food they need? Investigate this question by completing the Web Project in Caritas’ “Secondary Schools Food For All” resource http://www.caritas.org.au/learn/schools/secondary-school-teaching-resources#searchtop

Note: Use the topic filter “Food” to locate the resource.

7. Review the “Hunger map 2015” in the above article. Account for the patterns of undernourishment in the various regions.

8. In the above article it stated Nepalese women and girls do more than 50% of the work involved in agricultural activities. Why would education of women and girls improve food security?


How does Vinsen’s story demonstrate the importance of climate and predictable weather?
patterns to farmers and their food sources?


Complete a PMI strategy and discuss your findings.


What is the focus of this campaign? Who is this campaign for? Who can get involved?

Write one of the Caritas Internationalis ‘One Human Family, Food for All’ campaign goals.

Why do you think Caritas Internationalis has chosen to focus on the issue of food and hunger? How do you think food and hunger is related to human dignity? Set up a Padlet page for your class.

12. Explore Caritas’ “Food For All” interactive cartoon to learn more about global food issues: http://www.caritas.org.au/learn/schools/secondary-school-teaching-resources#searchtop

Note: Use the topic filter “Food” to locate the cartoon.


Hover with your mouse over the stomach, brain and throat tags to compare your answers. Identify three impacts of hunger you didn’t know before? What does this resource make you think? What does it make you wonder?


Use the Fiji case study to identify the food security challenges faced by the Pacific region. Complete the activities in the Fiji film study guide (pages 27-31): http://www.caritas.org.au/learn/schools/secondary-school-teaching-resources#searchtop

Note: Use the topic filter “Food” to locate the film study guide.


Note: Use the topic filter “Food” to locate this simulation.

16. View the online presentations of What the World Eats which have been adapted from the book Hungry Planet: What the World Eats by Peter Menzel and Faith D’Aluisio. Discuss the number of people the food feeds, the types of food, the cost of the food, etc. http://time.com/8515/what-the-world-eats-hungry-planet/ Create a waste free campaign for your school.


How does Caritas Australia work with communities? What are four of the long-term strategies that Caritas Australia uses to achieve sustainable and self-reliant food production?

18. Select a grain (eg: corn) and explain how the cultivation of this grain for biofuels, has created food security issues in a particular country.
Since the second half of the 20th Century tourism has developed into one of the most significant industries in the world both in terms of employment and revenue. Europe has long held the dominant place for the top tourist destinations, for example in 2015, 51.2% of the world’s tourist trade revolved around European travel (UNWTO). Recent events in Europe have cast doubts over the resilience of European tourism.

Understanding why a particular location becomes a popular tourist destination and, equally why a place loses its popularity, is complex. One methodology can be seen through the “5A approach”. This hinges around 5 key factors. See Figure 1.

Locations that can bring together these 5 factors will become a major destination. Paris, for example, has year after year been at the top of the list of the world’s most visited cities. On each of the factors, outlined above, Paris has dominated. Attractions include the Louvre, the world’s largest museum and art gallery, home to the Mona Lisa, the iconic Eiffel Tower and the original café culture and much more.

Paris’ Charles De Gaulle airport is one the busiest in Europe. Intercity rail hubs connect Paris to the rest of Europe. Hence Paris is a relatively easy city to access. Amenities for tourists are well developed. Activities are varied and easily accessed. Tours of every kind are available as are sporting events, countless museums, art galleries and shopping experiences. Accommodation options abound from exclusive 5 star luxury hotels to budget youth hostels.

These factors have combined to make Paris one of the most visited places on Earth. A series of recent events, however, has cast a long shadow over tourism in Europe, highlighting the susceptibility of tourism to geopolitical issues. Tourism is discretionary in nature, meaning that people have considerable choice over their destination and time of travel. Unlike other industries, such as the food industry, where demand is more constant as food is a necessity, tourism is very susceptible to “negative shocks”.

The northern hemisphere summer of 2016 will be remembered as a period of considerable political uncertainty and terror. Brexit, the impending exit of Britain from the European Union and terrorist attacks in Belgium, France and Germany have had an enormous effect on the tourism industry. Civil war and unrest across parts of North Africa and the Middle East, most notably Syria, Iraq and Afghanistan, have also impacted on Europe. Refugees, desperate for safety, have fled across the Mediterranean and Aegean Seas towards Europe. This has led to images not seen in Europe since World War Two. Hundreds of thousands of people walking across the continent as they head northwards towards Germany and other parts of northern Europe from their transit points in the south.

Figure 1: Factors that make a destination popular with tourists
The Migration Crisis

The impact of Europe's migration crisis on tourism has been significant. Figure 3 shows the main entry points of asylum seekers to Europe. These include southern Spain, Italy and Greece, all major tourism destinations.

What is the migration crisis in Europe?

Europe has always been a magnet for migrants. 2015 marked a dramatic change in migration to Europe as more than 1 million people sought refuge, many making the dangerous crossing from Turkey and North Africa across the Mediterranean and Aegean Seas. Thousands of people drowned attempting the crossing in tiny boats.

The reason for the mass migration is the increasing political instability in Europe's neighbouring regions. As can be seen in Figure 2, more than 172,000 asylum seekers arrived in Europe in the first 3 months of 2016 from 3 countries – Syria, Afghanistan and Iraq. These 3 countries are experiencing great political instability. In Syria, a vicious civil war has left hundreds of thousands dead and millions displaced and homeless.

Source of data: EuroStats

Figure 2: Countries of origin for people seeking asylum in Europe Jan-March 2016


Figure 3: Main entry points for asylum seekers to Europe

The Greek island of Lesbos, a popular tourist destination illustrates the impact of the crisis on the tourism industry. Located 10km from Turkey, Lesbos became a key destination/transit point for asylum seekers crossing the Aegean Sea. As it shares a border with Syria, Turkey is hosting more than 2.7 million refugees fleeing the violence of their homeland (UNHCR).

Lesbos is the epicentre of the migration crisis. Images of thousands of desperate refugees arriving in tiny boats have been shown across the world's media. There have also been reports and scenes of civil unrest as authorities struggled to cope with the arrivals.

Summer is the peak tourist season across Europe. Lesbos is usually packed with tourists seeking relaxation on the beaches with their views of the azure blue Aegean Sea. However, during the 2016 summer, tourists were sparse, not just in Lesbos but across the Greek islands and in many other places which have become entry points for asylum seekers.

75% of international and 35% of domestic flights to Lesbos and neighbouring islands were cancelled due to lack of demand. The island’s Hoteliers’ Association stated that its members had reported a 90% decline in room bookings compared to pre-crisis years.

For the 90,000 residents of Lesbos, the migration crisis has dramatically affected the tourism industry that is the island’s main source of income. Islanders, however, have shown remarkable resilience and have welcomed the newcomers. There have been calls from humanitarian workers to nominate the entire population for the Nobel Peace Prize for their support of the asylum seekers.

The Lesbos experience highlights the fragility of the tourism industry. Perceptions play a huge part in the decisions tourists make. Negative images in the media can profoundly reduce
the attractiveness of a destination. Geopolitical factors, even those that originate a long way off, can have profound impacts on tourism. Lesbos is working hard to rebuild its image focusing on the island’s amazing scenery and culture.

**Brexit**

Brexit, the decision of Great Britain to leave the European Union, was another shock for European tourism. Uncertainty has significant impacts on industries such as tourism that are discretionary in nature.

What is Brexit?

Brexit is the term created to describe the political movement for Britain to leave the European Union (EU). The EU is an intergovernmental organisation of 28 European nations, Great Britain joined in 1973. The EU has established common laws around trade, human rights and migration across the member states.

In June 2016 a referendum was held in Britain. The referendum asked citizens to decide whether Britain should continue to be a member of the EU or to begin the process of leaving the EU. In an unexpected result 51.9% of voters voted to leave the EU.

In the wake of the vote to leave the European Union, the British currency, the Pound, fell to its lowest value since the mid-1980s. The political uncertainty following the vote and fears of its implication for European trade to and from Britain resulted in widespread economic uncertainty. One of the main features of the European Union is the freedom of movement. Once having gained entrance to the EU, travel between the member countries is seamless. Some commentators have expressed a fear that Brexit will mark the beginning of other nations leaving the EU. The Netherlands, France, Austria, Germany and Belgium have very strong domestic political parties calling for their nation to exit from the Union. This could see a return to borders across Europe limiting access, one of the main factors in making a destination popular.

Despite the fears and negative commentary around Brexit’s impact on European travel, the United Nations World Travel Organisation noted in its most recent report on world tourism trends that while Brexit has increased uncertainty around European travel in the short term, the overall attractiveness of Europe, as a destination, will be minimal in the longer term.

**Terror Attacks**

The impact of the migration crisis and Brexit are, in many respects, around people’s perceptions and sense of uncertainty. This is likely to be transient as the desirability of Europe as a destination surpasses concerns. Terrorism is, however, a far more significant factor for the tourism industry in Europe. Political stability is a leading factor in determining the success of a travel destination. Yap and Saha (2013) noted that even when there is a strong desire to travel, political instability in the short term, reduces travel by 36% for every incidence of unrest. Thus, even though a destination may have all the key elements as shown in Figure 1, if there is political instability tourism will not thrive.

Safety and stability have been central to Europe’s success as a tourist destination ever since mass tourism began after World War Two. There have been terror attacks in Europe, most notably the 2004 attacks in Madrid and the 2005 attacks in London. However, 2015 and 2016 saw a different type of terrorism in Europe.

In the last two years, there has been a series of attacks, some large in scale and planning, such as the bombs in the Brussels airport and underground in April 2016. Other examples, however, “lone wolf attacks” where a single individual, often unknown to authorities, launched attacks with minimal infrastructure and support from organised terror groups. Most recently was the attack by a local resident of Nice, a southern French city, who drove a truck into crowds celebrating Bastille Day in July 2016 killing 85 people and leaving more than 300 injured. The killing of a priest during Mass in a suburban church, near Rouen, a few days later further heightened fears.

2016 has seen Europe shaken by numerous attacks. These attacks, in various parts of France, in Belgium and in southern Germany, have seen unprecedented security across Europe. Heavily armed troops are now a common sight. Long queues are ubiquitous, as people queue to have their bags searched and metal detectors passed over their bodies. Since the Nice attacks, France has mobilised a further 12,000 reserve police and soldiers to complement the thousands currently patrolling and guarding key sites around Paris and other major cities.

This chain of events is having a devastating effect on the tourism industry. Travel forecasting and analysis company ForwardKeys found that flights to Nice were 57% less full in the weeks following the attack than at the same time in 2015. Advance flight bookings for France had declined 20% and
for Nice 19% compared to the previous year. The Accor Hotel Group, France’s largest hotel chain saw their share price fall by 4% the day after the Nice attack as the fear of fewer travellers saw confidence in the industry decline further. Europcar, the biggest car rental company, experienced similar losses and this has continued in recent months. The Wall Street journal reported in late July that British travel company, Thomas Cook, had lost 52% of its share value in 2016. Ryan Air, one of Europe’s major budget airlines was down 23% compared to the same time in 2015. German airline Lufthansa announced it expected its profits to fall by 9% as a result of the events in Europe (Liautaud & Schechner, 2016).

The challenges for the tourism industry in Europe have been made worse by the fall in the exchange rate for the British pound, associated with the Brexit decision, as the cost of holidaying in European nations has become more expensive for British travellers, further reducing visitor numbers. It may not, however, be bad news for all of Europe. While American visitors to Brussels declined by 30% in the summer of 2016, compared to 2015, other European destinations saw a significant increase. Dublin’s visitor numbers, for example, rose by 43% as did Athens according to the large travel insurance company Allianz Global Assistance USA. These statistics reinforce the theory that travellers will alter plans and make decisions based around perceptions of personal safety.

Destinations that are seen as safe and trouble free are still experiencing growth. Spain’s tourism ministry reported a 12% increase in inbound visitors in the first half of 2016. Bulgaria is also experiencing a travel boom with resorts along the Black Sea coast reporting a big increase in traveller numbers in 2016.

Europe’s tourism industry is reeling from a series of shocks in 2016. A geopolitical crisis in neighbouring regions, particularly Syria and Iraq, has seen mass migration disrupt traditional tourism hotspots. Terror attacks have sent shockwaves across Europe creating fear and uncertainty. The decision of the British people to leave the European Union added to the uncertainty. While 2016 has not been a good year for its tourism industry, the fundamentals that have made Europe the world’s favoured holiday destination remain and the effects of the terrible 2016 summer are most likely to fade but in the short term there are troubled times ahead for Europe’s travel industry.

References:

Student Activities:

Comprehending
1. Which factors combine to make a location into a popular tourist destination?
2. Suggest reasons for the mass migration crisis in Europe.
3. Refer to Figure 3 and an atlas. List the main points of arrival for asylum seekers seeking entry into Europe.
4. List the impacts of the migration crisis on the tourism industry in Lesbos.
5. What is “Brexit”?
6. What impact has “Brexit” had on tourism in Europe?
7. Have the terror attacks of 2016 been different from those in the past? Support your answer with evidence.

Calculating
1. Refer to Figure 2. What was the total number of asylum seekers arriving in Europe from Syria?
2. Using statistics in the text, describe the impact of terrorism on tourism in Europe.

Analysis
1. Consider the town or city in which you live. List this location’s tourism potential using the “5A’s” approach.
2. If you were planning an imminent trip to Europe, would you reconsider your travel plans? Justify your reasons and share your thoughts with the class.

Research
1. Using the internet, conduct research into the recent terror attacks in Thailand. Have these attacks had a similar impacts on tourism as in Europe?
Climate change is already occurring in Australia according to experts from School of Earth Sciences and ARC Centre of Excellence for Climate System Science, University of Melbourne. The earth scientists say that anthropogenic climate change contributed to record breaking temperatures in 2013, and increased the likelihood of extreme events such as the prolonged heatwave experienced in Adelaide in January 2014. However, solutions to greenhouse warming caused or produced by humans will need to be enacted on a global as well as national scale. To what extent is this feasible? Locking atmospheric carbon dioxide into rock may provide part of the solution.

In 2009, a Swiss-born earth scientist, Professor Juerg Matter, was working in the arid environments of the Sultanate of Oman when he observed that a chalky rock was being deposited in iridescent blue alkaline rock pools. The predominant bedrock, peridotite, thrust up by tectonic action from the earth’s mantle, is particularly susceptible to chemical weathering because the olivine minerals in the rock react readily with water. Professor Matter was viewing the carbonation of CO2, changing carbon dioxide, which is a gas, into carbonate minerals, rocks which are stable and environmentally benign. In effect, Oman’s peridotite deposits naturally soak up about 100,000 tonnes of carbon every year. In short, CO2 is turned into limestone. How might this process assist in combatting global warming by divesting excess CO2 from the atmosphere?

The prospective numbers involved are massive and the potential costs enormous but an innovative project conducted in Iceland may be instructive. Professor Matter is one of the scientists working on the CarbFix Project. In June 2016, CarbFix https://www.oris/english/carbfix-project received worldwide attention in a variety of media after the publication of a paper in the prestigious journal Science by an international team of scientists. Subsequent articles were published in New Scientist, Wired Magazine, the New York Times, Japan Times, The Economist, the Conversation, The Guardian and The Australian.

Essentially the CarbFix Project’s scientists from Southampton University, where Professor Matter works, Columbia University, University of Iceland, University of Toulouse and Reykjavik Energy have effectively managed to store or sequester significant amounts carbon. They have turned gas into stone.

Basalt is a much more commonly found igneous rock than peridotite and is also a rock that contains reactive minerals that allow carbonation to take place through chemical weathering at or below the surface of the earth. Ten per cent of the world’s terrestrial rocks are basaltic and almost all the ocean floor consists of basalt. The CarbFix injection site situated about 25 km east of Reykjavik operates a 2000-metre-deep injection well deep into Iceland’s basaltic rock. The approach here involves dissolving the gas with water and pumping the resulting mixture — soda water, in effect — down into basaltic rocks, 400 to 800 metres below the surface, where the CO2 reacts with the rock to form the carbonate mineral calcite.

Basalts are well suited for this process to occur because they are rich in calcium, along with magnesium and iron elements that react with CO2. Further, the process takes place rapidly. Previous studies have estimated that in most rocks, the formation of chalky rocks would take hundreds or even thousands of years. CarbFix scientists found that between 95 and 98 per cent of the carbon dioxide was converted into calcite in less than two years.

Time is of the essence for the sequestering of carbon. Geological processes normally take place over millions of years whereby, CO2 is removed from the atmosphere through weathering of silicate rocks, such as basalt and then burial in marine sediments in the ocean depths. This is part of the slowest part of the carbon cycle where carbon from ancient forests is transformed into coal, phytoplankton into oil and gas, and, seashells and coral reefs into limestone. Most of Earth’s carbon—about 65,500 billion tonnes—is stored in rocks.
This is also the most stable part of the carbon cycle where 99.9 per cent of the planet’s carbon is stored, including approximately 80 per cent in chalky rocks such as limestone. The rocks form a dormant reservoir of carbon whereas the 0.06 per cent of carbon stored in the ocean and even smaller amounts found in the soil, plants and atmosphere is much more active. The twin processes of photosynthesis and respiration together with the movement of carbon into and out of the ocean are the main drivers of the rapid part of the carbon cycle. Carbon atoms may exist for some thirty years in the biota, for example, but remain for 100 million years in deep ocean sediments.

Burning fossil fuels and transforming limestone rock into cement releases carbon captured by the biota into the atmosphere. The 2007 Intergovernmental Panel on Climate Change report revealed that recently studied ice core records showed that the earth system has not experienced current atmospheric concentrations of carbon dioxide for at least 650 thousand years, over some six glacial-interglacial cycles. During that period the atmospheric CO2 concentration remained between 180 parts per million (glacial maxima) and 300 ppm (warm interglacial periods).

Prior to the industrial revolution, which started around 1750, CO2 levels had remained relatively stable at 260 to 280 ppm for some ten thousand years. Levels have steadily risen to just over 400 ppm today. Should the number reach 430 ppm the IPCC says that level of concentration in the atmosphere will correspond to 1.5°C of global warming. Theoretically we could limit or reduce carbon levels to 430 ppm by the end of the century. The first step is to reduce global emissions to zero by 2050. This would entail emitting no more than 800 billion tonnes of carbon equivalent between now and 2050. However that would lead to 2 degrees of global warming by 2050 so it would still be necessary to remove still more carbon from the air. We would need to remove a further 500 billion tonnes from the atmosphere to limit warming to 1.5 degrees by 2100.

The CarboFix project is a pilot program started in 2012. Currently, only up to 5,000 tonnes of CO2 per year are captured and stored in a basaltic reservoir beneath Reykjavik Energy’s Hellisheiði geothermal power plant. The 2014 IPCC report concluded that Carbon Capture and Storage, CCS, is an effective mechanism for tackling climate change cost-effectively. Nonetheless, there are some problems to be redressed regarding scaling up the CarbFix project. Large volumes of water are required. 25 tonnes of liquid are required for each tonne of gas sequestered. The infrastructure would also be expensive. However, as Professor Matter notes, at the moment “it’s free to pollute the atmosphere.”

CCS projects could be situated near the ocean to solve the water problem because the scientists say that seawater would work just as effectively as freshwater. It may be possible to use renewable energy sources harnessed on ocean platforms to capture the CO2 in the atmosphere and then inject carbonated water into basaltic formations beneath the oceans. But as Professor Matter explains, “Without a price on carbon emissions, there’s no business case.”

Net zero carbon emissions by 2050 could mean that some fossil fuels could be burned but the carbon would need to be removed from the atmosphere. There is some evidence that China, the European Union and the USA are burning less coal but oil and natural gas emissions will be more difficult to arrest. Clearly, there needs to be some other means of stripping carbon from the atmosphere. Still, CCS, using CarbFix technologies, is a much more feasible proposition than more commonly suggested current practices: storage in abandoned mines, sandstone rock formations or salty aquifers.

Mature forests, such as tropical rain forest and the great belt of coniferous forest across Alaska and Canada and the Russian taiga will not help in soaking up excess carbon because they are at equilibrium taking in no more carbon dioxide for growth than they give off. But afforestation and biochar schemes can help. Growing new trees or fast growing energy crops would be of assistance. Harvesting these plants when they reach maturity, growing still more plants, feeding the harvest into power stations and then capturing to concentrated CO2 before it leaves the power station (Bioenergy with CCS – BECCS) would be efficacious. Peter Smith, Professor of Soils & Global Change, who presented at the Paris Climate Change Conference in 2015 found that BECCS could capture 500 billion tonnes of CO2 over the second half of the century, as well as contributing a large fraction of the world’s electricity. Cultivating microalgae could also be used as fuel in BECCS power stations.

Burying biochar in the soil can also assist in storing carbon in the rapid phase of the carbon cycle. Agricultural waste such as straw, manure and unused food that has been decomposed under high temperatures to form charcoal can be buried into the topsoil. New Scientist magazine explains that biochar contains tightly bound carbon atoms; therefore it is stable for hundreds of years. Professor Smith calculates that biochar could sequester up to 125 billion tonnes of CO2 emissions between 2050 and 2100.

Carbon sequestration can take many forms. Together with the phasing out of fossil fuel burning the CarbFix technologies provide conceivable solutions to mitigate climate change: the most pressing problem of the Anthropocene. Australia signed the Paris Agreement (of the United Nations Framework Convention on Climate Change) in New York on Earth Day 2016 and is committed to limit global
average temperature to less than 2°C above pre-industrial temperatures while pursuing efforts to limit global warming to 1.5°C. Australia’s ‘Intended Nationally Determined Commitments’ will obviously be important but inventive programs such as CarbFix may well augment these national policy solutions.

Student Activities:

1. What is anthropogenic climate change?
2. How does the carbonation of CO2 take place?
3. Why were so many magazines and newspapers interested in the CarbFix Project?
4. Explain how the distribution of basalt rocks facilitates the process of ‘turning gas into stone’?
5. What is meant by the carbon cycle? Describe the slowest part of the carbon cycle and the most rapid phases of the cycle.
6. Compare the atmospheric concentrations over the last 650 thousand years with current levels of CO2 in the atmosphere.
7. Why will it be so difficult to limit global warming to 1.5 degrees by 2100?
8. How could a price on carbon affect the viability of Carbon Capture and Storage projects?
9. Why are the mature tropical rain forest and coniferous forest belts not able to soak up excess carbon from the atmosphere?
10. Explain how growing new forests would help in this regard.
11. Describe the BECCS process. How feasible is this process for limiting global warming by 2100?
12. How can burying biochar in the soil also assist in limiting global warming by 2100?
13. Is mitigating climate change really the most pressing problem of the Anthropocene? How does this problem compare with the prospect of species extinctions, ecosystem loss, increased pollution and rapidly increasing human population numbers?