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Introduction

Desertification is a strong and emotive term that resonates in the minds of all concerned for the well-being of our planet. Climate Change and Global Warming have become so widely debated that they span the worlds of science, economics and politics. It is contradictory that in a world of instant global communication and access to information on scales undreamt of even 50 years ago that the weight of uninformed or partially-informed opinions is as influential in human affairs as the weight of science. Science itself is regularly challenged. Images of the effects of ‘Desertification’ are regular features of TV news services, documentaries and political commentaries about dwindling resources and the causes of shifting populations. This article looks at deserts, desertification and the world’s greatest desert, the Sahara in North Africa, as an example.

Sahara in Arabic means ‘the greatest desert’ or ‘wilderness’.

The meaning of ‘Desertification’

The word ‘Desertification’ can be interpreted in a number of different ways but there are several vital components. It is important to understand that Desertification is not a new phenomenon. There are two main drivers – natural and human desertification. Natural desertification has been occurring on the earth’s surface over geological time (‘geological desertification’). Human desertification has emerged since the Holocene as humans aggregated into small communities and then larger societies requiring increased resources, via the uses of fire, stock and agriculture (‘anthropological desertification’). Both processes will be considered in this article.
Precipitation

One definition of a desert is that its precipitation is <250mm per year (approximately one inch in the old imperial measurement). The Sahara and much of Australia receive only this amount of annual precipitation. The term ‘precipitation’ is used instead of rainfall to include all airborne forms of water which therefore includes snow. The atmosphere of Antarctica is so dry that it cannot rain there. Snow only occurs on the coastlines from moisture derived from the sea. The interior of the Antarctic in fact only receives 50mm of precipitation per year which is less than the interior of the Sahara. However, in Antarctica when snow falls, the coldness of the atmosphere prevents it from evaporating so it packs down as ice and remains there.

Soils

The condition and extent of soils is a crucial indicator of deserts as they support the ecosystems. In contrast to the more humid regions of the world, soils of dry lands contain lower levels of organic matter. This is a fertility and binding agent which is also vital in moisture retention at the surface and at sub-soil level. Subsoil moisture is an important measure of the land’s capacity to endure dry or drought periods – like a ‘moisture reserve’ for hard times. The lack of organic matter and moisture means that in drier soils there is generally more mineral component that is not dissolved or taken up, meaning that dryland and desert soils have higher alkaline levels and/or salinity levels. When rare rainfall does occur, this can leach minerals further down into the subsoil and concentrate them, reducing the fertility of the soil mass. Regional scale aggregation of minerals occurs in broad sedimentary basins which form part of the underlying structure of the Sahara and Australian desert regions. Lake Eyre (Kati Thanda) in South Australia is an example of regional-scale salt concentration with a halite mineral crust across its entire surface of nearly 10,000 sq kms. Antarctica is an elevated plateau and only has tiny areas of soils in some of its few ice-free zones (eg the McMurdo Dry Valleys). Crucially, soils with reduced texture (less consolidated) are much more susceptible to wind erosion, especially across wide dry regions which offer virtually no wind resistance.

Transition Zones at Desert margins

It is easy for geographers to draw a zone or boundary on a map and label it ‘desert’. The 250mm rainfall isohyet is one such example. A specific vegetation line might be another – eg cram-cram grass in the southern Sahara (a vital fringe stock food). A temperature zone could be used. Distinctions are made between semi-arid, humid and semi-humid regions. However, all these measures are extremely variable from year-to-year which demonstrates the difficulty in assigning borders and definitions. One of the greatest examples of this variability is the SAHEL zone to the south of the Sahara Desert. This boundary shifts with changes in precipitation, great dust storms removing soil, changes in vegetation (including loss by human usage) and on a much larger and longer scale, with variations in solar energy itself.

Because the Sahel also covers approximately 15 countries with a combined population of 350 million across ‘sub-Saharan’ Africa, politics and economics also intervene in defining ‘deserts’ and ‘desertification’. A country suffering from identified ‘desertification’ can benefit from funding through United Nations Aid and Support programs, so acquiring the label is a key to income. Science and politics can clash and reduced resources to adequately monitor the natural conditions limit the capacity and credibility of scientific data. This can be manipulated by politicians into advantages for financial assistance. Transition zones are not just natural but also human-induced, or human defined, and the UN itself can be influenced from within in different ways by these pressures. Many scientists acknowledge that valuable monitoring of these areas would ideally require decades of records before proper interpretations can be made, even with the aid of satellite data, and are very concerned at the lack of investigative resources and opportunities at the present day.

Conclusion - Definitions of Desertification

Destructive effects of wind and precipitation on soils lead to ‘land degradation’, a term used to describe the desertification process. This concept is directly related to the carrying capacity of the landscape for vegetation and animals. One deceptively simple definition for desertification is ‘land becoming more desert-like’. Desertification is dryland degradation caused by both climatic variability and human activities – in varying proportions depending upon the nature of the events eg natural dust winds or human-induced flash flood damage caused by overstripping of gully vegetation.
Focus on the Sahara and associated Middle-Eastern and West Asian deserts

Description and Setting

The Sahara Desert in North Africa stretches 5,000 kms across from the west (Atlantic) coast to the Red Sea in the east, spanning at least 12 countries (map 2). However, the Red Sea is only a small interception across a far larger desert region extending eastwards from the Sahara to the foothills of the western Himalayas in northern Pakistan – another 5,000 kms across Arabia, Iran, Afghanistan, northern Pakistan and northwestern India (see map 1). Arabia alone has an area of 3.2 million ha, nearly half the size of the Australian continent (7.7m ha).

Figure 2: Location of Greater Sahara Desert

We are, therefore, talking about a pan-continental desert region of 10,000 kms which we could call the ‘Greater Sahara’ for the purposes of this discussion. It runs along the Tropic of Cancer in the northern hemisphere and is home to a total of ~30 countries with one billion inhabitants, extensive drylands often with large populations and ephemeral water supplies or restricted to intensively watered areas along desert rivers like the Tigris, Euphrates, Jordan and the Nile – all ‘exotic’ or ‘allochthonous’ rivers which do not commence in these areas but flow perennially through them.

Boundaries of the Sahara

• The northern limit is the coast of North Africa at the edge of the Mediterranean Sea
• The northwestern Atlas mountains can have snow but are considered part of the Sahara desert margin
• The southern limit has been defined by French researchers as the limit of the spiny cram-cram grass which fluctuates; this is possibly similar to the limit of saltbush in Australia. Cram-cram grass is a vital fringe-line stock food in famine times

Another southern edge Sahara 'boundary' is taken as the 200mm/yr rainfall line. This is highly variable and has moved north or south up to 250 kilometres as measured from infra-red satellite imagery of vegetation zones, a more effective method of monitoring as there is too little ground data. Over millennia, such a natural response is described as 'highly elastic'.

The southern margin of the Middle East deserts border the Indian end abruptly at the Indian Ocean. But to its south the Sahara has the Sahel and the Transition zone which affects another 15 countries with a population totalling 330 million, including Nigeria. It is the red and orange boundary on map 1 and the black border on map 3 - a band 500kms wide and which in the geological past has moved north or south by up to another 500kms. The nearest equivalent in Australia is the desert fringe inside the Great Dividing Range, the Kimberley Ranges together with southwestern WA on Figure 1.

Figure 3: Africa, Mean Annual precipitation

Source: Wiki Commons
Prevailing winds

Annual wind patterns are stabilised into the ‘monsoons’. These are not only the wet season winds in India, Southeast Asia and northern Australia, but are now defined as seasonal wind changes with rain-bearing and dry phases across the Intertropical Convergence Zone (see Figure 4). The Atlantic monsoons bring rain from the southwest in summer but are forced back out to sea nearly to the equator by the extensive ‘Harmattan’ hot dry winter winds driving down from the north in the summer.

Figure 4: Seasonal variation in Winds, Rainfall and the Intertropical Convergence Zone

Has the Sahara always been there?

Desertification has always been a natural process, long before humans evolved. Indeed, the development of the eastern and north African deserts has been suggested as a major contributing reason to the evolution of hominids from forest dwellers adapting to drier open scrubland and grasslands, and travelling increasingly to remote water sources and developing community and creative skills to survive.

Geology explains the origins of the Greater Sahara desert belt. Desertification processes across this huge region have their origins more than 7 million years ago. Prior to this time, the continents of Africa/Europe, North/South America and Australia/Southeast Asia were separated. This allowed the warm equatorial waters of the Pacific to flow westward into the Indian Ocean and then further westward via the Tethys Ocean (between Europe and Africa) to the Atlantic (see map 5). Finally, warm water combined in the Atlantic flowed between the American continents to re-join the Pacific in a huge global warm water cycle.

However Africa, Australia and South America were all moving northward towards Europe, Asia and North America respectively. Over a period 5-3 Ma (5 to 3 million years ago), these three pairs of continental plates collided, closing the Atlantic Ocean off from the Pacific, closing the Indian Ocean to the Atlantic and deflecting the Pacific warm waters away from the Indonesian Seaway to be replaced by colder northern Pacific water into the Indian Ocean. All these changes produced world-wide cooling of oceans and drastic global climate changes. This was also significantly assisted by a slight change in the tilt of the earth’s axis which had the effect of producing permanent ice caps in the Arctic and Antarctica. Continental drift and axial tilt are the largest natural forces causing desertification!

Ice cover and glaciers developed in North America cooling the Atlantic currents and the once-open Tethys Ocean became a landlocked sea – the Mediterranean. The Sahara ceased to receive extensive moisture-laden wind from the west. Wind patterns changed so that equatorial warm moisture-laden winds over the Atlantic became ‘sandwiched’ between dry ‘Trade Wind’ bands along both Tropic of Cancer and in the north and the tropic of Capricorn in the south. This is known as ‘inter-tropical aridity’ and being a stable system began the establishment of the ‘Mediterranean’ winter/cool/wet and summer/hot/dry cycles of seasonal patterns which had not been present before.

Finally the uplift of the Himalayas generated huge masses of cold dry air which flowed westward as a vast wind pattern of cold dry air from Pakistan across Arabia and the Sahara to the Atlantic. Similar effects occurred across the Asian steppes well into western China and the Mongolian deserts. Possible linked to atmospheric changes from the Himalayan uplift, on the opposite side of the world but at similar tropic latitudes the first Stony deserts of Australia began to develop.

Cooler Indian Ocean temperatures reduced the extent of rainfall onto the Ethiopian Highlands on the eastern Sahara margin to the extent that the remaining major inland river systems of the Sahara and Sahel lost their headwaters entirely and even the Nile River became reduced. Until much later when tectonic action opened the western entrance of the Mediterranean at Gibraltar, the greater Sahara was adjacent to a landlocked inland sea which gradually dried up and developed a salt floor across its basin similar to that of Lake Eyre in Australia and became a major source of Saharan salinity.
So desertification of the Greater Sahara was well under way millions of years ago. This was reinforced through the Quaternary period from 2.6Ma to the present through at least a dozen Ice Ages (also driven by planetary axial changes), so cold and dry that periodically glaciers formed on the Sahara margins in the Atlas Mountains to the northwest and the Ethiopian Highlands in the east but contributed more cold arid winds to the desert.

Figure 5: Geologic evolution of the Greater Sahara Desert

Palaeontologists have ascertained that various species of Saharan vegetation were already adapting to these changes, severe and prolonged as they were. These were drastic responses as the entire African rainforest effectively retreated southwards to the new equatorial position as the continent moved northwards towards Europe. Oil palm fossils from tropical forests have been found in the middle of today’s Saharan Desert, 3,000 kms north of the modern African tropical forest zone. In Australia, the groves of palm trees found in Kings Canyon and nearby areas in central Australia are remnants from a similar northward movement of our continent from cooler southern latitudes after separation from Antarctica. The Saharan tropical forests were replaced first by open woodland, then by grasslands, then fringe arid lands and finally true desert. Vegetation along the northern edge of the Sahara where it met the Mediterranean Sea began adapting to more set seasonal winter/cool/wet and summer/hot/dry cycles, these seasonal patterns being stabilised by the cold airmass effects of the now permanent polar icecaps.

Human Impacts
As stated earlier, humans evolved through these great changing processes and also adapted, developing stone tools to increase their ability to obtain a more diverse protein sources. They also followed diminishing water sources and habitable sites, actively migrating eventually northward via the Middle East desert to Mesopotamia where natural wheat and barley was discovered and the beginnings of agriculture began in the Holocene from 8,000 years ago. Early human activities such as herding and burning began the acceleration of already existing desertification, generating the human-induced ‘land degradation’ of our earlier definitions. Human activities have been in diverse forms depending on needs or resources but all have contributed to the acceleration of natural desertification-

Winds, Climate and vegetation changes
The cumulative effect of these massive geological movements delivered cooler drier wind patterns across the greater Sahara from the Atlantic in the west and the Himalayas in the east. Their effect accelerated desertification across the entire 10,000 kms and the results continue today. This process is known as ‘Climate Desiccation’, generated by -

- Reduced and erratic rainfall
- Higher Trade Wind velocities
- Increased wind regimes drying the soils and stripping them away
- The accumulation of huge mobile sand dune fields
- Blockage of semi-desert river systems by vast quantities of moving sand, disrupting basic river flow patterns
- Drying of inland lake systems deprived of river waters
- Vast dust storms reducing light and trapping heat at the soil surface
- Increased evaporation rates from the dry winds
**Human Activities contributing to Desertification of Drylands**

- deforestation (slash-and-burn)
- vegetation stripping
- bulk biomass burning in drylands
- drainage of streams, rivers and lakes
- re-routing watercourses
- over-pumping of groundwater
- mismanagement of water resources (or uncontrolled)
- mismanagement of aquatic ecosystems
- mining, particularly by stripping
- persistent extractive agriculture
- inappropriate agriculture eg ploughing, overgrazing
- inefficient irrigation
- cropping
- mono-cropping
- war and civil dislocation

**Effects of Human Impacts – known as ‘Manifestations of Desertification’**

**Atmosphere**

- Increase in atmospheric dust loads
- Smoke and increased CO2 emissions from burning
- Increase in particulate and trace gas emissions
- Increased evaporation rates
- Higher surface wind speeds
- Increased surface temperatures
- Lower near-surface atmospheric moisture levels

**Plants**

- Forest -> savannah -> margin species
- Increased evaporation rates
- Reduction in species diversity and plant biomass
- Loss of efficiency of dryland ecosystems
- Reduction in the overall dryland productivity

**Soils**

- A reduction in soil moisture levels
- Increased near- and sub-surface temperatures
- A reduction in soil moisture retention capacity
- Accelerated soil erosion by wind (sheet areas)
- Dune reactivation
- Accelerated soil erosion by water (slope and gully erosion)
- An increase in surface runoff and streamflow variability
- Increasing salinisation of soils and near-surface groundwater supplies
- Dryland soil alkalinity
- Soil crusting
- Soil compaction
- Decrease in soil fertility

**Water**

- Spring and soak reduction
- Increased uncontrolled runoff
- Increase in variability of stream flows
- Choking of rivers with sediment
- Increased siltation
- Siltation of downstream reservoirs
- Salinization of lakes, rivers and wetlands
- Mounding of groundwater in saline soils
- Freshwater ‘margin’ ecosystems degraded
- Aquatic biotas reduced in resilience

**People and Societies**

- Changed travel routes
- Changed trade needs and opportunities
- Social and locational disruption
- Impoverishment of the human communities dependent on these ecosystems
- Famine
- Disease
- War
- Migrations
- Susceptibility to ‘strong man’ rule – various versions of dictatorships

A fundamental reason behind the human dislocation listed above is a poor distribution of limited resources and fragile or less robust societies which cannot manage the resources against vested interests. Where a state of lawlessness begins to develop, people prefer some stability which may be the stability of a strongman or one-party State. Funding is vital but even if it comes from the United Nations or other western sources it can easily be channelled through the ruling group for other purposes rather than ‘Land Remediation’ which is so necessary. Essential requirements are -
• Soil quality must be stabilised and maintained
• Fair water distribution
• Effective water distribution
• Healthy water distribution
• Finance
• Conservation programs
• Restoration programs
• Utilise simple technologies which are locally appropriate
  (e.g. not highly irrigated shelter belts which increased groundwater use and salinization)

Band-aid fixes are not solving the issues, however well-intentioned. Ultimately, lands which are suffering from desertification, particularly if human-induced, need stable communities to undertake the necessary management of the remediation programs. Humans are remarkably innovative in the face of challenges. The Romans colonised the northern fringe of the Sahara along the coastline but could never cross the Desert to access the gold mines of West Africa. Instead, the Africans maintained a highly-profitable gold trade for many centuries by crossing the desert northward through Timbuktu with the help of a simple but very clever invention – a suitable saddle for camels. This single adaptive innovation developed to trade across the Sahara brought wealth to West African kingdoms for many centuries.

**Student Activities**

1. What is the definition of desertification that is accepted by the United Nations?
2. Suggest at least 2 ways in which this definition may be problematic.
3. Describe the distribution pattern of those regions most at risk of desertification. Can you identify any relationship with their latitudinal position and/or their continental location? Support your answer with selected examples.
4. Construct a factors table. Enter examples for each of the categories. You may like to use Social, Economic, Political and Natural factors.
5. Research ‘sand breaks’. Draw a well-labelled sketch diagram to explain how they reduce wind erosion.
7. Can you find an example of a collapsing dryland ecosystem which has had a widespread effect on human dryland populations?
8. Weather systems have been crucial to Desertification across the Sahara for millennia. Can you summarise in a sentence the main features of these weather patterns:
   - ITCZ – Intertropical Convergence Zone
   - North Atlantic Oscillation
   - ENSO
   - Southern Oscillation
   - El Nino
   - La Nina
9. Identify three countries in the ‘Greater Sahara’ region that are regularly in the news – identify the main resources of each and the advantages and disadvantages of this resource? Are there some countries that do not appear to have a major resource?
10. Where are Australia’s major desertification problems? What important advantages does Australia have in dealing with them compared to the nations of the Greater Sahara region?
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ONE CITY-TWO WAYS OF SEEING-
SAO PAULO, BRAZIL

By Susan Bentley, Justice Educator (QLD), Caritas Australia

Introduction

In today’s globalized and interdependent world, over half the world’s population (54%) lives in urban areas. This radical global urban transformation, from a 30% urban world in 1950, to a predicted 66% urban world in 2050, will bring further profound changes to the size and spatial distribution of the global population. 1. Rapid urban growth and the globalized nature of cities now frame many of society’s greatest challenges. The 21st century urban landscape is closely linked to exclusion and rising inequality, the upsurge in international migration, challenges in providing urban services, safety and security issues, climate change and increasing residency in slums and informal settlements. Clearly, the current global urbanisation model is unsustainable.

According to the UN-HABITAT’s “World Cities Report 2016” the emerging urban agenda should promote sustainable cities and human settlements that are environmentally sustainable and resilient, socially inclusive, safe and violence-free, economically productive; and better connected to and contributing towards sustained rural transformation. This is in line with the 2030 Agenda for Sustainable Development, especially Goal 11: to make cities and human settlements inclusive, safe, resilient and sustainable.

Sao Paulo-a mega-city

Globally, one in eight people live in a mega-city (more than 10 million inhabitants). Sao Paulo is currently the 4th largest mega-city in the world with a current population of approximately 22 million which is expected to peak at 24 million by 2030. São Paulo is a metropolis of positive and negative superlatives. The city accounts for nearly half of the state’s population (Sao Paulo state=41 million), 1/10 of Brazil’s population and 1/5 of its economy. As Brazil’s finance and business capital and largest exporter, it is often referred to as the “Powerhouse of Brazil”. However, resilient poverty, inequality, social exclusion and spatial segregation also pervade the urban landscape of Sao Paulo.

Figure 1: Paraisopolis favela, Sao Paulo

Photo Credit: Tuca Vieira, 2005, 2

From the 1960s to the 1970s the city of Sao Paulo experienced rapid urbanisation due to mechanisation of farms, shortage of alternative jobs and a shift towards manufacturing. Millions of impoverished peasants abandoned rural Brazil and migrated towards the rapidly industrialising cities in the south-east of the country.

Today at the urban heart of Sao Paulo, ultra-luxury apartments and office blocks with designer interiors are clustered together with hundreds of elite shopping malls stocked with designer products, high-end electrical goods and the latest computer technology. This is a city with one of the highest levels of inequality in the world - a feature of rapid urbanisation which is encapsulated in the daily commute.

Figure 2 and 3: Heli-pads blot the top of Sao Paulo’s skyscrapers.

Photo Credit: Eduardo Martino image 2

With approximately 470 registered choppers, São Paulo has the largest fleet of helicopters in the world ahead of Tokyo and New York. Executive...
corporate travellers are known to take an estimated 70,000 private helicopter flights each year across São Paulo to escape traffic jams and insecurity - avoiding moving around Sao Paulo on land, fearing mugging and even kidnapping. They also estimate that the time they waste in traffic jams costs them more than the use or even ownership of a helicopter. Flying from Alphaville, an up-market residential area on the outskirts of Sao Paulo, to Avenida Paulista, the financial heart of the city, takes only 7 minutes. To cover the same distance by car could take up to 2 hours.

**Life for the urban poor in Sao Paulo**

In contrast to the city of Sao Paulo’s immense opulence and wealth, lies another world where access to, or inclusion in, the reality of the elite is unimaginable. This is a world where development of infrastructure, basic services and adequate housing has failed to meet the demand caused by rapid urbanisation, resulting in the spatial appearance of inequalities and the spread of informal settlements such as slums and shantytowns, also referred to as favelas. There are some 1,600 favelas and 1,100 “irregular” land subdivisions (developed without legally recognized land titles) in Sao Paulo. They are typically overcrowded, with the highest levels of population growth and density in São Paulo, and they tend to lack adequate or legal connections to municipal water, sanitation, electricity, telephone services, health and educational facilities and transport services.

**Figures 4 and 5: The architecture of survival in the favelas.**

Informal settlements account for 8% (2010 figures) of São Paulo’s city land. In 1970 only 1% of São Paulo’s population lived in favelas, compared to today’s estimates of 20% (approximately 2 million people). Favela residents are socially excluded by lack of adequate transportation to access jobs, health services and education:

- Only 58% of youths from favelas and corticos attend secondary school with 39% abandoning their studies before completion. By contrast 72% of students from non-vulnerable households are enrolled in secondary school and 22% abandon secondary school;
- The under-5 mortality rate reflects health inequality based on socio-economic status: among the poorest 20% of the population (living in favelas) infant mortality is staggeringly high, at 99 deaths per 1000 births. Among the richest 20% of the population, however the under 5 mortality rate is two thirds lower at 33 deaths per 1000 births;
- Favela workers have little access to social rights and legal protection and their vulnerability is further enhanced with informal working agreements or employment contracts. Only 16% of people living in favelas have their own vehicles and face a daily commute of up to 4 hours and 25 minutes;
- Only 56% of favela dwellers are connected to sewage systems;
- Household rubbish is collected in approx. 60% of favelas. In the meantime household rubbish accumulates around properties, is thrown directly into lakes or rivers, or sometimes is simply burnt or buried in the ground.

São Paulo’s urban landscape is also home to 600,000 people who live in 1,900 corticos. This high density rental housing is typically located in sub-standard large residential blocks with shared kitchen and bathroom facilities.

The city’s socio-spatial inequality, segregation and urban degradation has proven to be a catalyst for social mobilisation. The poor in São Paulo are not submissive: they have a strong history of activism. The Movement for the Defence of the Favelas (MDF) was formed in the late 1970’s in the Eastern Zone of São Paulo, during Brazil’s military dictatorship (from 1964 till 1985). The strategic plan of the organisation focuses on the development of individuals and communities in amplifying voice and building capacity to combat oppression due to the cycle of poverty. The promotion of the dignity and self-worth of each individual is paramount in MDF’s planning for programs and community development work. MDF has a proven track record in addressing social inequality for some of the most marginalised communities in the favelas of São Paulo. Across 40 favelas in São Paulo, MDF helps people to build confidence and challenge the cultural structures that support prejudice, violence and injustice in their communities.

**Figure 6: MDF’s logo**
Partnerships: Caritas Australia’s partnership with MDF initially commenced in 1985. In 2001 this partnership was renewed in response to a submission from MDF for assistance in the establishment of a Cultural Centre for youth to combat the influence of gangs and the ever increasing drug trade. Caritas Australia works with MDF to improve living conditions, promote peace, encourage leadership and create opportunities for education and employment for favela residents. The movement is based on a three pronged development approach:

1. Presence (Strong and dynamic community presence in the favelas)
2. Resistance (Lobbying government for social, political and economic change)
3. Solidarity (Supporting communities without a voice, the most vulnerable and marginalised)

Training programs

The animation of local community groups through a variety of training programs enables the favela community members to sustain their long journey of social transformation. Examples include:

- Facilitating participation and representation in municipal and state government by the shantytown dwellers;
- Providing legal and structural support to communities to obtain land titles and land ownership;
- Assisting communities in future planning for housing with dignity; Representatives of the favela communities are trained in planning for the future development of housing allotments with access to clean drinking water, adequate sewerage systems and land allocation for community centres;
- Providing adult literacy programs and leadership formation;
- Coordinating the construction of community centres and childcare centres which provide a haven for pre-schoolers who would otherwise be left alone at home or with their primary school age siblings;
- Supporting and coordinating very successful community income generation programs such as bakeries, catering and recycling projects throughout the favelas.

Empowerment focus

MDF conducts mapping and profiling of vulnerable communities. This offers favela residents a platform to voice what they think the main issues are. Then, local authorities are contacted and MDF advocates on behalf of the favela residents. The organization has been successful in improving the living conditions of thousands of families, by attaining access to water, electricity and sewerage systems. They are also securing certificates of ownership of land, so that favela residents can no longer be evicted at any time, en masse.

In order to sustain dynamic change, there is growing agreement in São Paulo that local communities must themselves take part in the process of upgrading the favelas. Following a course in solidarity economy organised by MDF, Cristiano Cardoso and his partners decided to get involved in waste recycling. “A group was already informally sorting the waste outside the favela, so we merged with them, adding a legal and administrative aspect”, recalls the young father. Its members formed a cooperative and worked in the open air, under the viaduct that runs along their district, Villa Prudente. They visited schools and businesses in order to put collection points in place. The 25 members of the cooperative now process two tons of waste every day.

MDF also promotes opportunities for cultural expression and cultural integration and offers hope and dignity for young people and families through Centro de Culturas, or the Cultural Centre. It is housed in the centre of one of the most violent favelas in São Paulo and is a focal point in the lives of the 30,000 plus residents of Villa Prudente (one of the favelas MDF works in).

Figures 7 and 8: MDF Cultural Centre.

Photo credit: Caritas Australia

One of the main aims of the Cultural Centre is to build the self-esteem of residents through a wide range of cultural activities. It challenges young people to develop and use their gifts and talents to bring about social transformation to benefit themselves and the wider community. The Centre’s Art and Dance/Drama classes offer young people an opportunity to channel their passion and creativity into meaningful outcomes. Mentoring is
an important part of the program and the young people develop a sense of dignity, self-worth and respect for others. In 2011, MDF introduced a pilot module to the program that uses multimedia as a tool for countering the culture of drugs and violence of the favelas.

Maristely lives in the Nova Divineia favela (slum) in Sao Paulo, Brazil and is a young leader of the favelas. With Caritas Australia’s partner, MDF, she and other local leaders advocate for their rights and promote peace rather than violence. Maristely is a product of educational opportunities which offered her choices and equipped her with the skills to be a youth advocate for social and political change in her local community.

MDF is recognized throughout São Paulo and wider Brazil as an advocacy organisation which stands in solidarity with the most marginalised and empowers members brings about change is people centred.

**Conclusion**

Sao Paulo is a paradigm of juxtapositions inherent in a local metropolis in the global world. Its economic rise is paralleled by sharp economic inequalities and socio-spatial segregation. Yet there is a new drum beat setting a vibrant rhythm of hope. A deprived periphery, poorly serviced hinterlands and ruptures between the formal and informal city have become unacceptable politically, economically and morally to residents of Brazil’s largest metropolitan region. Sustainable urbanization is key to successful development. Today Sao Paulo is a city in transition as it strives to create an urban landscape that is sustainable, strategic, resilient and inclusive.

In August 2015 seventy irate British dairy farmers from the English Midlands took two of their cows into a supermarket to protest about the price that they were paid for their milk. In February 2016 numerous angry French farmers blocked roads with their tractors and trailers across Brittany, Normandy and Picardy protesting about collapsing European milk and pork prices. In May 2016 Swiss dairy farmers reported that prices were so low that milk producers were no longer able to cover their costs.
Student activities

1. Brainstorm a list of contemporary global trends.

2. Test your knowledge of global population patterns and trends: [http://www.unesco.org/education/tlsf/mods/theme_c/interact/modl3task01/multi_page_quiz4.htm](http://www.unesco.org/education/tlsf/mods/theme_c/interact/modl3task01/multi_page_quiz4.htm)

3. Watch human population grow from 1CE to present and see projected growth: [https://populationeducation.org/content/world-population-video](https://populationeducation.org/content/world-population-video)

4. Respond to the following questions after viewing the GapFinder video “Urbanisation”: [https://www.youtube.com/watch?v=w33hPL4tdNg](https://www.youtube.com/watch?v=w33hPL4tdNg)
   d. Where are the world’s most/least urbanised countries?
   e. Is urbanisation slowing down or increasing? Why? What impact is this trend having on human well-being?
   f. Which global regions are experiencing the least rapid urbanisation? Why?
   g. Describe the distribution of megacities between 1950, 2000 and 2015. Look in particular at trends in regions according to each point in time.

5. The Sustainable Development Goals: At the United Nations Sustainable Development Summit on 25 September 2015, world leaders adopted the “2030 Agenda for Sustainable Development”, which includes a set of 17 Sustainable Development Goals (SDGs) to end poverty, fight inequality and injustice, and tackle climate change by 2030.

Points for discussion:

- The SDGs emphasize that they apply to all, even the most disadvantaged and powerless. How can we make sure that everyone benefits from the Global Goals?
- SDG Goal 11: Make cities inclusive, safe, resilient and sustainable. Today 828 million people live in slums and the number keeps rising.

6. View “Growth of Sao Paulo, Brazi (1905-2014)”: [https://www.youtube.com/watch?v=d7QgTMQYaKE](https://www.youtube.com/watch?v=d7QgTMQYaKE)

Locate the city of Sao Paulo on the “World City Populations 1950-2030”: [http://luminocity3d.org/WorldCity/#3/12.00/10.00](http://luminocity3d.org/WorldCity/#3/12.00/10.00)

(a) Account for the dramatic shift in Sao Paulo’s population 1950-2015.

(b) What are the implications of Sao Paulo’s predicted 2030 Global Ranking?

(c) Research the factors which have contributed to Sao Paulo’s number 1 National Ranking.

(d) Compare and contrast Sao Paulo’s population growth to one other city ranked within the top 12 largest cities in the world. Account for your findings.


8. Watch the Project Compassion 2014 feature film: [https://www.youtube.com/watch?v=WP-SkGu_7SI](https://www.youtube.com/watch?v=WP-SkGu_7SI)

Use the film study guide questions (Pages 10-21) to explore Maristely and her community’s story in Sao Paulo, Brazil and the topic of urbanisation (Pages 24-36), in more depth. NB: Use the filter topic “Project Compassion- Past” to locate the Film Study Guide and Urbanisation Focus Study: [http://www.caritas.org.au/learn/schools/secondary-school-teaching-resources#searchtop](http://www.caritas.org.au/learn/schools/secondary-school-teaching-resources#searchtop)

9. MDF’s core work is social transformation in all its dimensions, particularly through civic participation and representation.


(b) Why is it important for people/communities to have a voice in the decisions which impact on their lives? How does this approach differ from a deficit development model?

10. Photo literacy:
(a) What caption would you give this photo?
(b) What do you **SEE** in this slide?
(c) What do you **THINK** about this contrast?
(d) What do you **WONDER** about this place?

11. The world’s cities occupy just 3% of the Earth’s land, but account for 60–80% of energy consumption and 75% of carbon emissions. Explore Caritas Australia’s advocacy campaign “Our Common Home” and accompanying “Climate Justice” themed classroom resources and Action Kit: [http://www.caritas.org.au/act/our-common-home/resources](http://www.caritas.org.au/act/our-common-home/resources)

12. Use a Venn diagram and compare and contrast life in your nearest urban location with life in a Sao Paulo favela/cortico. Discuss whether there are any similarities between the two locations and the reasons why this might be so.

**References**

  Accessed: 29/06/16
  Accessed: 17/06/16
  Accessed 14/06/16
In May 2016 some five hundred protesting Victorian dairy farmers, with placards reading “The Bucket Stops Here” and “Milk Cows Not Farmers”, marched from Federation Square to Parliament House to protest about suddenly imposed lower farm gate milk prices. The procession included tractors, four-wheeler motorbikes, men on horseback and a dairy cow. The Victorian community was generally supportive of the protesters with one hotel owner offering free meals for dairy farmers and their families. More seriously Centrelink, Lifeline and other welfare agencies have had to deal with requests for emergency food payments, welfare and mental health counselling. The farmers were disillusioned and shocked by a retrospective milk price cut that was effectively backdated to the beginning of the 2015-16 financial year.

The price drop that was initiated by Australia’s largest milk processor, Murray Goulburn, and then matched by the New Zealand-based transnational corporation, Fonterra, affected more than seventy five per cent of Victoria’s dairy farmers. Should these lower prices continue into the next financial year as many as twenty per cent of Australia’s 6,000 dairy farmers would lose money and probably leave the industry or cease dairy production until market conditions improve. Cows have already been despatched to abattoirs in Victoria and Tasmania to be converted into hamburger beef. There are reports of a four to six week queue of cows awaiting slaughter.

The crisis is a difficult one to understand but it largely rests on the position of the Australian industry in the global market; the fact that Australian dairying is a totally deregulated commercial operation but one that is controlled by significant corporate interests. Owner operated farms dominate the industry with 98 per cent being family owned and only 2 per cent in corporate ownership. There is no government control over the price that processing companies pay for farmers’ milk with the farm gate price determined on the milk fat and protein solids content of the milk. Deregulation has led to a decline in the number of farms nationally, from nearly 20,000 in 1985 to just over 6,000 today, with herd size increasing from nearly 100 to almost 300. Farmer-owned cooperatives no longer dominate the industry although Murray Goulburn cooperative still accounts for 37 per cent of the national milk output. Australian prices are driven by world dairy commodity prices which, in turn, determine local export returns. Approximately 75 per cent of milk production is exposed to world prices for butter, cheese and milk powders; the remaining 25 per cent is consumed within Australia as liquid drinking milk. Contrary to popular perceptions liquid milk sales are still strong and have steadily increased since Coles supermarkets introduced their $1.00/litre milk in January 2011.

Put at its simplest the dairy industry in the southern states is directed by the forces of global supply and demand. The majority of farmers in Victoria, Tasmania and South Australia are dependent on export prices for milk used in manufacturing dairy products such as butter, cheese and milk powders whether they are exported or consumed locally. This majority exceeds 90 per cent in Tasmania and Victoria. By way of contrast, in other regions fresh drinking milk makes up a much larger proportion of the production totalling as much as 100 per cent in Queensland and over 80% in Western Australia. In these dairy regions higher farm gate milk prices are generally paid to ensure the year-round supply of milk. Therefore, the epicentre of the milk crisis is in the southern states: in the Bega valley of NSW,
Northwest Tasmania, Southeast South Australia, Southwest Victoria, Gippsland and Goulburn/ Murray Valley dairy regions, with roughly two thirds of Australia’s dairy industry concentrated in Victoria alone.

Here the big corporations are dominant players with the most recent development being the rise in infant formula production for both Australian supermarkets and the export market. The export drive has seen Bega Cheese, Fonterra Australia and Murray Goulburn announce partnerships with established nutritional companies to develop their infant formula businesses.

Although Murray Goulburn still operates as a cooperative the company recently listed a Murray Goulburn Unit Trust on the Australian Stock Exchange to raise capital to fund a Victorian-based infant formula facility, bulk cheese plant and new fully automated UHT milk beverage plant. The Murray Goulburn board envisaged an optimistic future for the company and its farmers, driven largely by a seemingly insatiable appetite in China for Australian powdered milk, announcing deals with a global paediatric nutrition company Mead Johnson Nutritional and an Indonesian company Kalbe Nutritional.

Three large multinationals operate in Australia including Fonterra (New Zealand), Kirin (Japan) that owns Lion Dairy and Drinks (Pura and Dairy Farmers), and Lactalis (France) that has taken over Parmalat (Pauls). Fonterra is a major player in manufactured milk, the world’s largest dairy exporter accounting for almost 40 per cent of global dairy trade, the fourth largest dairy corporation worldwide behind Nestle (Switzerland), Danone (France) and Lactalis.

Kirin has established the largest specialty cheese factory in the southern hemisphere in Burnie, Tasmania and Lactalis has developed exporting facilities in Gippsland including whole milk powder, cream cheese and UHT products. Australian dairy company Warrnambool Cheese & Butter (88 per cent controlled by the Canadian company Saputo) is a prominent cheese producer and exporter and sells almost all the milk powder it produces on the international market. Bega Cheese has announced a joint venture to produce Blackmores’ infant formula. The six major dairy firms account for around 85 per cent of farm gate milk collections, processing about 8 billion litres of milk per annum.

The current problem for the big firms is an oversupply of dairy products on the world market. The ominous result for the youngest and most indebted Victorian farmers is uncertainty and exceedingly bleak future prospects. Oversupply has been stimulated by the growing demand for dairy products, particularly milk powder, from China. Between 1999 and 2013 the Australian farm gate price of milk more than doubled. However, the Global Dairy Trade auction, the international industry’s main dairy commodities index, hit a 13-year low in July 2015 and has stayed low since then.

In the United States dairy production has boomed with dairy farmers benefiting from cheaper feed corn prices (80 per cent of US dairy farm costs are feed) because large-scale oil fracking has reduced the demand for biofuels made from corn. The US cheese glut alone is so large that every person in the United States would need to consume an extra 1.4 kg of cheese over the course of this year to diminish last year’s additions to the cheese mountain. US dairy producers have looked to the export market to sell off excess supplies of dairy products (the US currently has a 14 per cent share of the world’s dairy trade, compared with New Zealand’s 38 per cent, European Union’s 32 per cent and Australia’s 6 per cent). Such was the Chinese demand for dairy products that US dairy exports increased by almost 40 per cent through the first quarter of 2014.

In the European Union the removal of quotas in March 2015 has also led to spikes in dairy production, particularly in Ireland (up 30 per cent in 2015) and the Netherlands (up 17 per cent). The milk quotas were introduced in 1984 to address the problems of the legendary ‘milk lakes’ and ‘butter mountains’ that European farmers had dumped on the market. More recently the Europeans looked to the ‘Far East’ in particular wanting to emulate New Zealand to become a major player on the apparently burgeoning world market. By the end of 2015 dairy production in the EU had added an extra 2 billion litres of milk a year to a vastly oversupplied market place. Some 180 000 tonnes of milk powder is stored in European warehouses. Generally, the world is overstocked with milk powder with huge stockpiles accumulating in China. Further, low demand for milk powder from oil exporting countries has occurred as a result of depressed world oil prices.

In Russia, previously the world’s second largest importer of dairy products (after China), embargoes on dairy imports imposed after the Ukraine crisis has constrained Australian imports. Prior to 2014 Russia was Australia’s largest butter market.

Excess supplies from the European Union have posed a severe challenge for Australian exports to South East Asia, a major export destination
for Australian dairy products. Demand for dairy products from China has plateaued and European Union dairy exports significantly increased to China as well. Japanese demand has 'softened' affecting Australian exporters, with Japanese importers drawing down on their existing sizeable stocks of dairy products. Japan is the most important export market for Australia accounting for 17 per cent of exports by value followed by China, Indonesia, Singapore and Malaysia.

The farm gate price is crucial for dairy farmers. Last year there were some depressed price signals coming from Fonterra in New Zealand when the price there plummeted to $3.85 a kilogram of milk solids for the 2015-16 season (with an extra 40-50 cents coming from shares in the Fonterra cooperative that supported NZ farmers to make a total effective payout of $4.25 to $4.30/kgMS). In Australia, Murray Goulburn stubbornly clung on to much higher prices for too long essentially ignoring low global prices and then suddenly, in May this year, cut its farm gate milk price from $5.60 a kilogram of milk solids to between $4.75 to $5.00/kgMS for the entire 2015-16 financial year, backdated to last July. To meet these impositions on their milk suppliers the cooperative offered to pay the 'inflated' price of $5.60/kgMS for this financial year and then take this impost out of the next three years earnings. Fonterra Australia then dropped prices to $1.91/kgMS for the last two months of the financial year in an equivalent move. Fonterra Australia had a supplier agreement, which forced them to match their competitor’s price. Indeed, Fonterra had maintained all along that the milk price was too high but was forced to match Murray Goulburn's price through the supply agreement.

Industry analysts have predicted an initial $4 to $4.50/kgMS price for the forthcoming financial year. Victorian farmers maintain that they need at least $5/kgMS to make a living on the productive irrigated pastures of the Murray/Goulburn valley dairy regions. These regions are the most at risk not only because of the depressed milk prices, but also increasing costs of irrigation and a large proportion of highly geared (high debt relative to equity) farming enterprises. Even if the global milk price recovers Murray Goulburn suppliers will be faced with a further impost to the cooperative over the next three years. State and federal governments, together with some of the big banks, have offered concessional loans but many farmers feel very threatened, will be pushed deeper in debt and will leave the industry. Perhaps it is time to contemplate more regulation in the dairy industry? Canada operates a supply management model where domestic demand matches domestic supply and dairy exports are non-existent. Canadian dairy farmers can make long-term decisions about their farms and maintain a middle class lifestyle because representatives of producers, consumers, processors, restaurant associations and others get together every year to determine prices. Incidentally, consumers in Ontario Province regularly pay $1.00/litre for their supermarket milk and farms are typically more technologically advanced than their Victorian counterparts with hundreds of farms in Ontario using robotic milking.

Perhaps it is time to consider more carbon efficient farming in the southern dairy regions. Gippsland farmers could contemplate growing apples or vegetables that are in high demand such as kale or broccoli. A university led study, in conjunction with Gippsland farmers, Agriculture Industry Transformation - Gippsland Project (2009) has developed mathematical models and land suitability maps for 20 agricultural and forestry commodities and looked at likely yields under differing climate change scenarios.

Global milk prices are notoriously volatile and can rebound quickly but we should bear in mind the impassioned view of the French president of the Auvergne-Rhône-Alpes federation of farm unions, ‘We can’t carry on like this. We are being asphyxiated.’
Student Activities

1. What is the ‘crisis’ in the Dairy Industry? Is it confined to Australia?
2. What has led to this crisis in parts of Australia?
3. For which Australian dairy products, including processed goods, is the demand highest?
4. On a map of Australia, mark in and name the regions of dairy production.
5. Which regions in Australia are hardest hit by the downturn in prices? Suggest reasons.
6. Construct a chart that identifies the multinationals involved in the dairy industry, their country of origin, their subsidiaries and their products.
7. Construct a pie graph to show the percentage share of the world’s dairy trade. (You will need to add another category “Other”)
8. What proportion of farm gate milk do they collect in Australia?
9. What causes are suggested to explain the oversupply of dairy products on the world market?
10. How has the drop in the farm gate milk price precipitated the ‘crisis’ described in Q1?
11. Describe Canada’s supply management model. Do you think it could be used in Australia?
12. Given the increasing costs of irrigation water in southern Australia’s dairy regions, can you see a role for carbon efficient farming?