



www.litusgo.eu

LitusGo Manual
Module 17
Droughts



Editor: Isotech Ltd, Environmental Research and Consultancy
www.isotech.com.cy

LitusGo is funded with the support from the European Commission through the Leonardo da Vinci Programme - *Multilateral Project for the Development of Innovation, 2009.*

This educational manual reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

ISBN set 978-9963-720-00-2

ISBN 978-9963-720-18-7

Preface to the LitusGo Education Manual

The LitusGo Manual is part of the LitusGo educational package which is included in the LitusGo portal: www.litusgo.eu. LitusGo aims at the training and capacity building of Local Authorities and local stakeholders in Integrated Coastal Zone Management issues and the reaction to the impacts of climate change.

This Manual consists of 20 autonomous, self-contained and inter-related modules. The modules are available in four languages, Greek, English, Maltese and Turkish and in three different forms: the dedicated wiki application in the LitusGo portal, the dvd and the hard copy version. This hard copy version of the LitusGo Manual consists of 20 self-contained booklets, one for each module, kept in a hard collective case.

List of modules of the LitusGo Educational Manual

- Module 1: European legal framework
- Module 2: Stakeholder involvement/Public participation
- Module 3: Sustainable tourism-carrying capacity
- Module 4: Water resources management
- Module 5: Fisheries/fish farming
- Module 6: Coastal water quality
- Module 7: Ecosystems management (land and coastal ecosystems)
- Module 8: Waste management/recycling/compost
- Module 9: Air pollution
- Module 10: Land uses/urban planning/coastal over-development
- Module 11: Landscape and marine-scape management
- Module 12: Coastal erosion control
- Module 13: Community annoyance issues 1: noise pollution
- Module 14: Community annoyance issues 2: light and thermal pollution, odours
- Module 15: Archeological areas/historic sites/cultural heritage
- Module 16: Extreme conditions management: flood risks, coastal flooding and storm surge
- Module 17: Droughts
- Module 18: Desertification
- Module 19: Energy use, consumption and management
- Module 20: Green buildings

Credits

The LitusGo Education Manual has been developed by the LitusGo Educational Manual Working group:

Modules 1, 2, 6, 7, 8, 9, 12, 13, 14, 16, 17, 18, 19 have been prepared by the scientific team of the beneficiary/coordinators ISOTECH Ltd. Major authors: Michael I. Loizides, Chemical/Environmental Engineer and Xenia I. Loizidou, Civil/Coastal Engineer. Constantinos Georgiades (MSc in ICZM) is responsible for the overall editing. The hard copy of the educational Manual is designed by Anastasia Georgiou.

Modules 3, 4, 5, 10, 11, 15, 20 have been prepared by the scientific team of the Sustainable Aegean Programme of ELLINIKI ETAIRIA - Society for the Environment and Cultural Heritage. Major authors: Georgia Kikou, Geographer, MSc Environment (Manager of the Sustainable Aegean Programme), Alexandros Moutaftsis, Economist, MSc Environment, Leonidas Economakis, Political Sciences, MA International Development.

Dr Alan Pickaver on behalf of partner The Coastal & Marine Union (EUCC) was responsible for the quality control of the educational material.

LitusGo partnership:

Coordinator/Beneficiary:

ISOTECH Ltd Environmental Research and Consultancy

www.isotech.com.cy

Cyprus:

Municipality of Pafos www.pafos.org.cy

AKTI Project and Research Centre, www.akti.org.cy

Greece:

ELLINIKI ETAIRIA - Society for the Environment and Cultural Heritage www.ellet.gr / **Sustainable Aegean Programme,**
www.egaio.gr

ONISIS web development www.onisis.gr

Malta:

Municipality of Kirkop www.kirkop.gov.mt

The Netherlands:

EUCC – The Coastal & Marine Union www.eucc.net

Module 17

Droughts

1| Theoretical background

Drought is a normal, recurring feature of climate and it occurs in virtually all climatic regimes. Drought is the consequence of a natural reduction in the amount of precipitation received over an extended period of time, usually a season or more in length, although other climatic factors (such as high temperatures, high winds, and low relative humidity) are often associated with it in many regions of the world and can significantly aggravate the severity of the event.



Photo 1. A goat walks along the sun-baked bed of Cyprus's largest reservoir at Kouris [1].

Drought is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rainfall in relation to principal crop growth stages), rainfall intensity,

number of rainfall events etc. Thus, each drought year is unique in its climatic characteristics and impacts [2]. Most droughts tend to occur during summer, as the weather is hot and water is quickly evaporated. Droughts can last for years in most extreme cases, and can devastate crops and livestock and have a substantial impact on the ecosystem and agriculture.

In the last few years, several regions in Europe have been affected by drought. The drought of 2005 was one of the worst in the last centuries for large parts of the continent but was especially bad in the Mediterranean region. In 2006, drought affected the major part of Spain and Portugal and large parts of the United Kingdom, Italy and France.



Picture 1. Drought areas of the Mediterranean Region [4].

Three major types of droughts:

- Meteorological drought is brought about when there is a prolonged period with less than average precipitation. Meteorological drought usually precedes the other kinds of drought.

- Agricultural droughts are droughts that affect crop production or the ecology of the areas. This condition can also arise independently from any change in precipitation levels when soil conditions and erosion triggered by poorly planned agricultural endeavors, cause a shortfall in water available to the crops. However, in a traditional drought, it is caused by an extended period of below average precipitation.
- Hydrological drought is brought about when the water reserves available in sources such as aquifers, lakes or reservoirs fall below the statistical average. Hydrological drought tends to show up more slowly because it involves stored water that is used but not replenished. Like an agricultural drought, this can be triggered by more than just a loss of rainfall. For example:
 - In Cyprus, the massive cultivation of potatoes, since 1960, in the area of Kokkinohoria (Famagusta region) led to the over pumping of the aquifer. This resulted in a drop of the aquifer level by 30-40 meters from 1960 till today, with a significant problem of sea water intrusion in the coastal aquifer. The level of aquifer now is so low that it is considered as hydrological drought.

Precipitation in Cyprus [8]:

According to the Meteorological Service of Cyprus, the average precipitation on the island during the 20th century reveals a downward trend at an average rate of 1 millimeter per year.

The average precipitation during the period 1991/92-2007/08 (17 hydro-meteorological years) is 457 mm or 9% lower than the

normal (503 mm) in the period 1961-1990. The average temperature in the period 1991-2007 is 17.7°C or 0.5°C higher than the normal (17.2°C) of the period 1961-1990.

According to the Meteorological Service of Cyprus, by 2030 the precipitation is expected to be reduced by 10-15% and the temperature is expected to increase by 1.0-1.5°C compared to the normal average values of the period 1961-1990.

2| Objective

Droughts are a natural phenomenon. However, they are becoming more severe due to human activities. Local Authorities and local communities can take action in order to be able to accommodate and minimize, as much as possible, the impacts of droughts in their areas. However there is a gap in information, training, capacity building and competences when it comes to local authorities and local stakeholders, especially in the Mediterranean. The LitusGo project is making an effort to fill this gap, so that Local Authorities and local stakeholders will develop skills and competences to take action, implement measures and strategies to avoid wrong decisions and practices that worsen the impacts of droughts, at least at local level, and improve as much as possible local conditions and the micro-climate.

3| Problem

Periods of drought can have significant environmental, agricultural, health, economic and social consequences. The effects vary according to vulnerability. For example, subsistence farmers are more likely to migrate during drought because they do not have alternative food sources. Areas with populations that depend on subsistence farming as a major food source are more vulnerable to drought-triggered famine.

It has been calculated that the economic impact of the drought in 2003 in Europe was about €11 billion. The biggest economic impact in the Mediterranean usually concerns agriculture since it is the most water dependent sector, but other sectors are also affected [4].

Drought can also reduce water quality because lower water flows reduce dilution of pollutants and increase contamination of the remaining water sources. Common consequences of drought include:

- Famine due to lack of water for irrigation. Malnutrition, dehydration and related diseases
- Mass migration, resulting in internal displacement and international refugees
- Social unrest
- War over natural resources, including water and food
- Diminished crop growth or yield productions and carrying capacity for livestock
- Shortages of water for industrial uses

- Reduced electricity production due to insufficiently available coolant for power stations, and reduced water flow through hydro-electric dams
- Habitat damage, affecting both terrestrial and aquatic wildlife. Loss of species in flora and fauna and aquatic ecosystems
- Dust bowls, themselves a sign of soil erosion, which further erode the landscape
- Dust storms, when drought hits an area suffering from desertification and erosion
- Wildfires, such as Australian bushfires, are more common during times of drought

What can we do?

Module 18 “Desertification” of the LitusGo Manual provides useful and applied actions that can be taken at Local level to combat the local effects of desertification. Many of those suggestions apply also to this module. So, please check the LitusGo Module 18.

Some more drought-specific measures/actions that can be undertaken at local level are listed below.

Local Authorities may:

- organise **capacity building and training programmes** to enhance local expertise and local skills, so that local stakeholders are aware of the tools and the techniques available to minimize the impacts of droughts at local level.
- **Enhance stakeholder involvement:**
 - Appoint a local “drought task force”, a small and flexible committee with the participation of local experts and local decision-makers. So, a blend of science and politics can plan and act together.
 - Set up a local drought preparedness plan and **implement it** with the participation of local stakeholders. Do not prepare plans and announce actions that are not going to be implemented.

- **Plant cover:**
 - Select plants resistant to droughts and to high temperature and use less water-intensive plants and crops, and plant public areas. Encourage citizens to plant their yards with drought resistant plants (eg. Succulents, cactus)
 - Cover and protect the soil surface using plants

- **Water saving policies**
 - Reduce water losses – encourage the use of water saving devices in houses and agriculture (see LitusGo module 4: Water resources management)

- **Keep the drainage (natural and manmade) systems for rain runoff clean of debris and structures:**
 - Regular maintenance of road drainage. Clean from debris.
 - Abusive dumping of construction wastes coupled with abusive construction buildings in valleys may lead to the deviation of the rain water into the neighborhood and flooding occurs with devastated results to third party property. Insert stricter measures to keep valleys clean and pristine and speed up the process of the demolition of the illegal constructions.

- **Sustainable soil treatment, e.g.** implement composting (see LitusGo module 8 on waste management) and nourish the soil with compost (the humus of compost is precious for soil). It will improve soil resistance to droughts.

References/useful information:

E-Sources:

1. <http://uk.reuters.com/article/idUKL2455576320080324>
2. <http://en.wikipedia.org/wiki/Drought>
3. <http://weather.about.com/od/drought/f/droughts.htm>
4. http://assets.panda.org/downloads/wwf_drought_med_report_2006.pdf
5. [http://www.cyprus.gov.cy/moa/agriculture.nsf/All/77A01739DA3F0874C2257528002BE3F1/\\$file/Final%20Report-%20Desertification1.pdf?OpenElement](http://www.cyprus.gov.cy/moa/agriculture.nsf/All/77A01739DA3F0874C2257528002BE3F1/$file/Final%20Report-%20Desertification1.pdf?OpenElement)
6. <http://weather.about.com/od/drought/f/droughts.htm>
7. http://www.moa.gov.cy/moa/ms/ms.nsf/DMLcyclimate_gr/DMLcyclimate_gr?opendocument
8. <http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&language=EL&reference=A6-0149/2006>



www.litusgo.eu

2012

ISBN set 978-9963-720-00-2

ISBN 978-9963-720-18-7