GLOBAL CLIMATE UPDATE COURSE

CYPRUS CLIMATE WORKSHOP PROJECT

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TOPIC: How will the Cyprus economy be affected by expected shifts in temperature and water availability or by sudden shifts in severe weather that make it difficult or unattractive for tourists from abroad to travel to Cyprus? Cyprus has already become come to depend in the late summer upon the supply of water from mainland Greece. What plans does it have for the provision of water if drought in Greece makes it impossible for these contracts to be honored?

ECONOMY-TOURISM- importance of water scarcity on the matter

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*Impacts of climate change on tourism

* Governmental, semi-governmental Organizations and relevant treaties

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INTRODUCTION

From the establishment of the Republic, tourism played an important role for the islands' economy, while from the 1960s Cyprus became one of the main tourist centres of the Mediterranean, after a rapid and continuous growth.
Cyprus, at the crossroads of Europe, Asia and Africa, is situated in the north-eastern corner of the Mediterranean Sea, 75km south of Turkey, 90km west of Syria and 380km east of the Greek island of Rhodes. It is the third largest island in the Mediterranean after Sicily and Sardinia, with an area of 9.251 sq km [14].

Summers in Cyprus are hot to very hot and extremely dry, with virtually no rain from mid-May until October. With rising sea levels increasing prospects for the intrusion of saline waters into coastal aquifers, however, and with the climate expected to continue to dry out, water will remain a perennial problem. As elsewhere in the Mediterranean, Cyprus can expect to be increasingly vulnerable to flash floods arising from more frequent extreme rainfall events, from more intense Mediterranean storms, and from beach erosion due to increased wave heights and rising sea levels [3].

LITERATURE REWIEV

Key sensitivities to Mediterranean tourism include drought and heatwaves, both of which are likely to increase with projected greenhouse warming. Adaptive responses must include lengthening of the present season and particularly taking care to cater for the increasing number of older people in the population of Northern European countries who will demand high environmental and accommodation standards and look for more bespoke holidays than the mass market tourist. Climate change in Northern Europe may affect the push-pull factors which currently favour a summer peak of tourists in many Mediterranean destinations. Infra structure and beaches may well be at risk from sea level rise and there are likely to be increased problems from forest fires, water supplies and hygiene [2].

To ensure the sustainability of the tourist industry in Cyprus, it has been recommended that a strategy of protection of infrastructure combined with planned retreat would be effective and appropriate to local circumstances. The overall goal would be to maintain the limited beach area to sustain the vital tourist industry, specifically by erecting hard structures, enforcing building set-backs, and use of artificial nourishment, although the latter measure may require external sources and sand. Although not all these strategies may be applicable to atoll states, many other island nations-such as Barbados, Jamaica, Grenada, St. Lucia and Singapore- already have began to implement similar approaches as part of the Integrated Coastal Management process [4].

Major holiday decisions within many of the ‘tourist exporting’ countries of Northern Europe are subject to a push and pull effect. The higher temperatures and settled weather of the Mediterranean summer exert a big attraction, but better summers at home will reduce oversees holiday bookings. Giles and Perry (1998) have shown that the exceptional summer of 1995 in the UK led to drop in outbound tourism and a big reduction in the peak demand for Mediterranean package holidays. Large numbers of people indulged in short-term opportunistic decision-making and switched their normal holiday preferences to take account of the unusually favourable conditions at home. Such limited evidence does suggest that climate warming might alter the competitive balance of holiday destinations with adverse effects at high season tourism in the Mediterranean.

The Mediterranean is likely to become less attractive for health reasons in the summer. Apart from the dangers increasingly associated skin cancer many Mediterranean beach resorts may simply become too hot for comfort in the peak season, with a much higher frequency of severe heat waves (Perry 1987). Carter (1991) has used an approximate index of climatic favorability to investigate changes of seasonal climate in Europe under possible future climate change. Results suggested that a climate warming in Europe 4 degrees Centigrade would lead to a shift in the optimal summer time climate from the traditional southern coastal reports northwards to currently less fashionable regions [5].

High economic dependence aggravates the problem

Negative climatic consequences always have particularly serious effects if climate-sensitive tourism has major economic importance. In Europe this applies to Malta, Cyprus, Spain, Austria and Greece. In the Caribbean, e.g. the Bahamas and Jamaica are disproportionately affected; in Asia, Thailand and Malaysia and in Africa Tunisia and Morocco. The island states in the South Pacific and the Indian Ocean are particularly reliant on tourism. If tourists stay away from them, the economic setbacks are extremely serious.

The new challenge of climate change

In climate change, the tourism industry is now confronted by a new challenge. Unlike natural disasters or terrorist attacks, this is not just a short-term effect that could then be quickly forgotten. Rather, climate change will permanently alter the attraction of some holiday regions and force them to take steps to adapt in the next few decades. It is taken for granted that there will be regional and seasonal shifts in both national and international tourist flows during the next few years. As a result it is also evident: there will be winners and loser from climate change. The remainder of the tourist value creation chain (e.g. tour operators, travel agencies, airlines, hotels) will not be left untouched by this

Tourism occupies a dominant position in the economy of Cyprus.

- In 2006 it was expected to contribute 10.7% of GDP.
- in real terms it generated CYP£2,598.2 mn (US$5,445.0 mn) (annual-2006).
- total employment was estimated at 113,000 jobs (29.7% of total employment = 1 in every 3.4 jobs).

Cyprus became a full member of the UNWTO when the organisation was created in 1975.[2]

According to the World Economic Forum's 2007 Travel and Tourism Competitiveness Index, Cyprus' tourism industry ranks 20th in the world in terms of overall competitiveness. In terms of Human, Cultural and Natural Resources (in relation to the tourism industry) Cyprus ranks 3rd in the world.[3][6].

SIGNS OF CLIMATE CHANGE

An aerial view shows depleted water reserves at Kouris reservoir in Limassol district, Cyprus November 9, 2007. The sun-baked earth in the empty pit at Kouris is a sign of the unprecedented water crisis facing the Mediterranean island. As climate change takes effect, authorities face the dilemma of how much to use energy-intensive desalination to beat the shortage. Picture taken November 9, 2007. To match feature CYPRUS-WATER/ REUTERS/Andreas Manolis (CYPRUS) [8]

The impacts of climate change on water resources in order of importance for Cyprus:

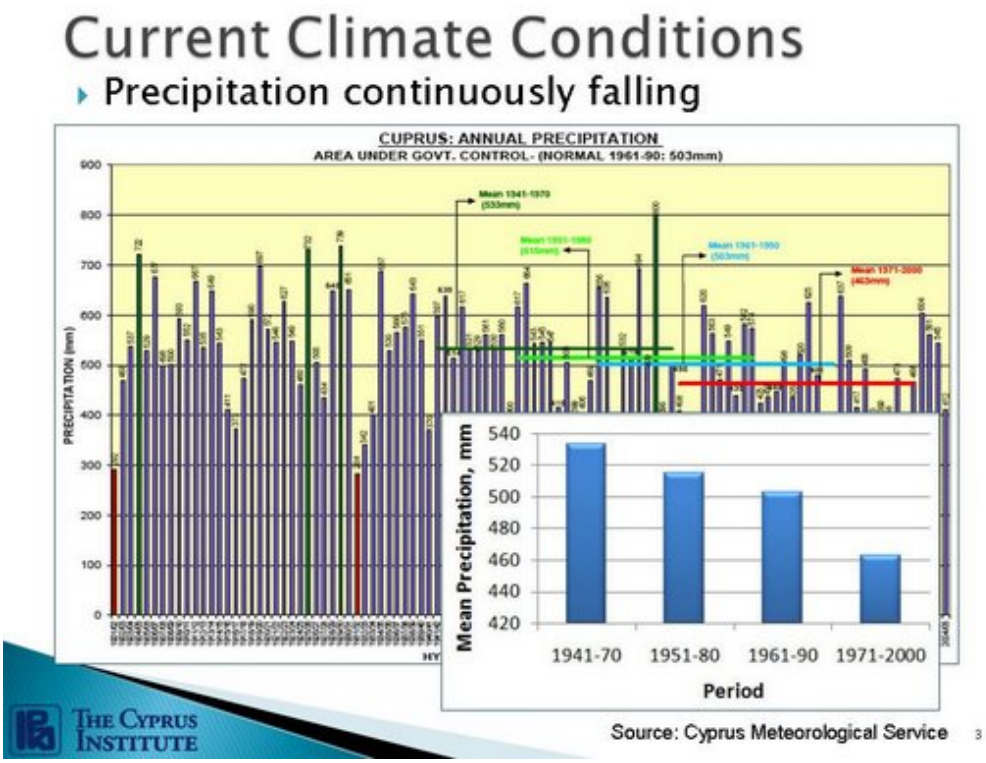
1. Warm spells/heat waves; frequency increases over most land areas: Increased water demand; water-quality problems (e.g., algal blooms)

2. Area affected by drought increases: More widespread water stress

3. Increased incidence of extreme high sea level (excludes tsunamis): Decreased freshwater availability due to saltwater intrusion

4. Over most land areas, warmer and fewer cold days and nights as well as warmer and more frequent hot days and nights: Effects on water resources that rely on snowmelt; effects on some water supplies

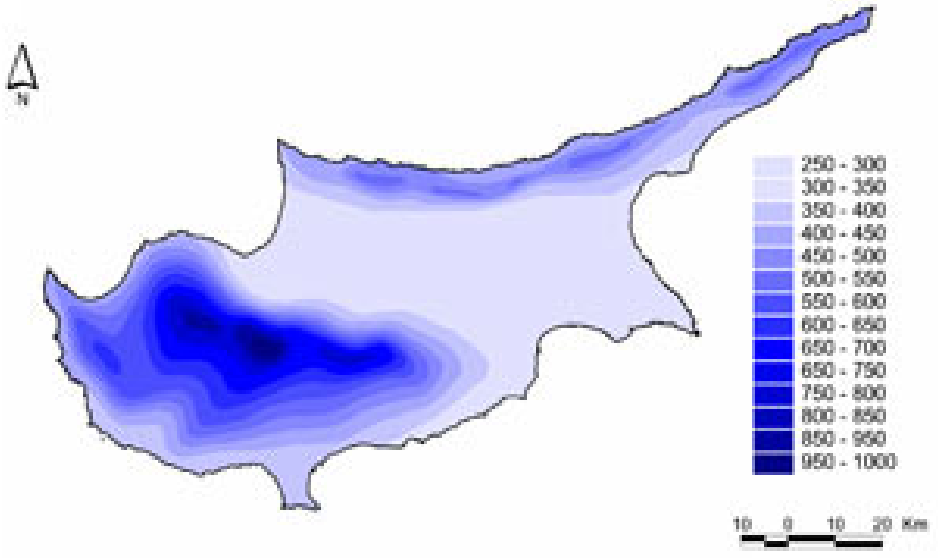
A climatic change is often recognized as a progressive trend. Statistical analysis of precipitation in Cyprus reveals a decrease of precipitation amounts in the last 30 years.



The statistical analysis of the records available over the period 1941-2000 demonstrates that the precipitation time series presents a step change or shift around 1970 and can be divided in two separate periods. From 1941 to 1970, the precipitation records do not show any trend. From 1971 to 2000, the data show a slight decrease in the precipitation but this trend is not significant compared to the variations from year to year.

The shift in mean precipitation is larger in the central mountainous sector than in other areas. The mean of the annual precipitation of the recent period is 100 mm or more lower than mean of the older period at almost every location of elevation higher than 500 m. This decrease ranges from 15% to 25% of the mean precipitation of the first period. The decrease of the annual precipitation is essentially due to a decrease of the precipitation during the months of December, January and February.

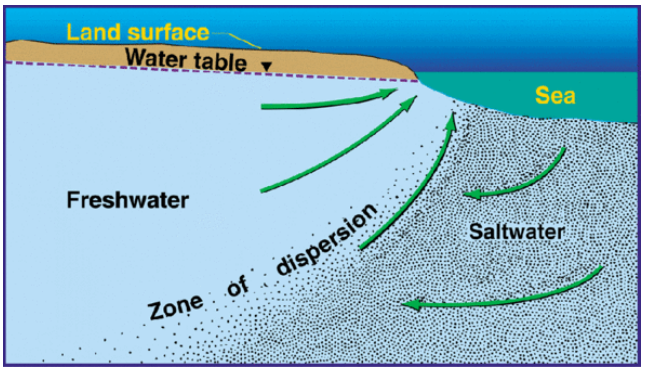
Since the last couple of decades, all of Cyprus's water resources were originating from rainfall. Based on a long series of observations, the mean annual rainfall including snowfall it was 503 mm, but observations on the last 4 decades indicate that it is reduced to 463 mm. The amount of water is equivalent to 2.670 million cubic meters (mcm) but only the 14% or the equivalent of 370 mcm is available for utilization since the remainder 86% returns to the atmosphere as direct evaporation.



The rainfall is not uniformly distributed where most of it falls on the two mountainous areas whereas the eastern low level and coastal areas take a very small amount of rain. It must be noted also, that Cyprus is experiencing a big variation of rainfall for year to year, and also from frequent droughts which have duration of two to three years.

The mean annual amount of water of 370 mcm is distributed roughly with the ratio of 1.75:1 between surface and groundwater respectively [15].

Landscapes are growing more barren and are speckled with the crackled pits of empty dams. Conditions both for people and for the island's ecosystems are getting pretty bad.



Saltwater intrusion is another important problem affecting water resources of Cyprus as can be seen in the below given illustration.

Increase in sea levels and drawing excessive water from ground wells are the main reasons causing saltwater intrusion.

In conclusion, water resources in Cyprus are directly impacted upon by climatic changes, reduced rainfall, longer hot spells and ensuing drought conditions. The situation is further exacerbated with saltwater intrusion.

GOVERNMENT, SEMI-GOVERNMENT ORGANIZATIONS and RELEVANT TREATIES

Ministry of Commerce, Industry and Tourism: The Ministry of Commerce, Industry and Tourism is responsible for the formulation and implementation of Government policy on matters pertaining to trade, industry, tourism and Consumer, in such a way that it will contribute positively towards the further development of the Cyprus economy and the well-being of the population of the island. The administration of the Ministry handles the general policy and directs and co-ordinates all the departments and services of the Ministry for its effective implementation [7].

Cyprus Tourism Organisation: The Cyprus Tourism Organisation was established in 1969 by the Government of the Republic of Cyprus. The organisation's objective, according to law, is to organize and promote tourism within the Republic by using all possibilities and resources available.

The organisation provides assistance to professional bodies, companies and individuals who have an interest in Cyprus' tourism. But as a semi-governmental and non-commercial organisation, it does not perform the functions of a travel agent [9].

Water Development Department (WDD): The **Water Development Department** is responsible for implementing the water policy of the Ministry of Agriculture, Natural Resources and Environment. Main objective of this policy is the rational development and management of the water resources of Cyprus. In this context, the responsibilities of the department cover a wide and diverse spectrum, which includes:
a) the collection, processing and classification of hydrological, hydrogeological, geotechnical and other data necessary for the study, maintenance and safety of the water development works,
b) the study, design, construction, operation and maintenance of works, such as dams, ponds, irrigation, domestic water supply and sewerage schemes, water treatment works, sewage treatment and desalination plants, and
c) the protection of the water resources from pollution[13].

Water Saving Measures by WDD: By following a number of water saving measures, which require little time and money to implement, not just during drought conditions but year-round, significant amounts of water can be saved.

- Check the plumbing installation for leaks.
- Check taps for drips and make repairs promptly.
- Install plastic water bags in the toilet flush tanks.
- Take a shower instead of a bath and avoid having to run the water until it’s hot. Turn off shower water while you apply soap to body.
- Encourage and advise children not to mess around with water in the bath, garden or anywhere else.

- Turn off water while you shave and/or brush teeth.
- Wash only full loads in the washing and dish washing machines.
- Water the garden with a watering can early in the morning or in the evening when evaporation is limited.
- Wash the car with a sponge and a bucket, instead of a hosepipe, which is prohibited by Law.
- Use a broom, not a hose, to clean verandas and pavements. The use of a hosepipe is prohibited by Law [12].

Traditional street "fountain"(1949)

The Lisbon Treaty: A new treaty to respond to the challenges of the 21st century**.** Its entry is effective and in force from 1 January 2009. Approved by EU leaders on 18-19 October 2007, the Treaty of Lisbon amends the current EU and EC treaties, without replacing them. It will provide the Union with the legal framework and tools necessary to meet future challenges and to respond to citizens' demands. The Treaty of Lisbon will bring many benefits: it will ensure European citizens have their say in European affairs and see their fundamental rights set out in a charter. The EU will be better equipped to meet expectations in the fields of energy, **climate change**, cross-border crime and immigration. It will also be able to speak with one voice at the international scene [10].

Now let's have a look at the labour market and employment situation in Cyprus by the help of a document prepared by the Department of Labour. *employment policy* *strategic development plan*

DEVELOPMENTS IN THE ECONOMY AND THE LABOUR MARKET[1]

Macroeconomic Characteristics: The Cyprus economy during 2004-2007 performed very satisfactorily with an average annual growth rate of 4.1% in real terms in comparison to 2.5% in the EU 27. During 2007, the annual growth rate reached 4.5% in conditions of macroeconomic stability.

The increase in economic growth was reflected in an increase in the average labour productivity growth rate to 1.3% (estimate) during the period 2004-2007. The real unit labour cost decreased to 2.5% (estimate) from 4% in 2006, however, it continues to be higher than the EU-27 average (1.5%), indicating a lower competitiveness of the Cyprus economy.

During the same period, the Cyprus labour market was characterized by conditions of almost full employment with high participation and employment rates and low unemployment rates. Particularly in 2007, the strong economic performance contributed to exceptional performances in the labour market with an increase of employment by 5.8% and a decrease of the unemployment rate to 3.9%.

Trends in the Labour Market: (*Participation in Employment)* Due to strong economic growth around 40,000 new jobs were created during the period 2004-2007, of which 90% were created in the services sector. The sectors of real estate and business activities, public administration and defense, manufacturing and education experienced the greatest increase in employment, while in contrast, the sectors of hotels and restaurants and manufacturing demonstrated a negative employment growth.

Unemployment by sector of economic activity and educational attainment level

The highest number of unemployed persons were Newcomers (3.339 persons) to the labour market. Furthermore, the highest proportions of unemployed persons were concentrated in the Hotels and Restaurants sector (2.575 persons and unemployment rate 9.7%) [11].

Although I am unable to suggest that the increase in the unemployment rate in the Hotel and Restaurants sector is due to climate change, I strongly believe that the association will prove correct in the coming years if necessary measures are not taken promptly by the government and the industry.

Analyzing the individual global stressors on water resources for Cyprus by providing specific examples on each one:

1. Energy and climate (as stressors): Climatic changes, reduced rainfall and draughts are impacting on Cyprus's water resources the most. Increased evaporation from dams and saltwater intrusion are making resources even scarcer.

2. Population: Increase in population is resulting in increased water demand. Hotels, tourism industry as well as swimming pools and golf courses all have a negative effect on water resources in Cyprus by creating increased consumption.

3. Land use: Change in land use have caused reductions in recharges to the groundwater system. Changes to land cover have increased runoff. Consequently the level of the water table has receded over the years.

4. Urbanization: Over building and badly planned urbanization process have had a negative influence on biodiversity and aquatic ecosystems e.g. Pedios River and its unique habitat. Temperatures have increased in city centres leading to spiraling energy consumption and climate change.

5. Economic growth: Economic growth and incorrect application of incentives and pricing policies, has resulted in pollution and wastage of water resources both by domestic users and trade and industry. E.g. pollution of groundwater, importation of water by ship at huge costs!

The opportunities in technologies and engineering (in order of importance) I think are most appropriate to solve the water problem in Cyprus and PROPOSALS:

1. Water efficiency and substitution in engineering design > Better design and efficiency in use must be the first areas to explore in solving the water problem in Cyprus. Preventing wastage and making the resources go further are the first logical steps to take. Various incentives and pricing policy as well a better systems and awareness can be effective tools in this regard.

2. Water reclamation and reuse > Reclaiming and trying to reuse water that has already been used before is very important where resources are scarce such as Cyprus. These methods have to be explored to the maximum benefit before considering more expensive solutions such as desalination and /or long distance transfer.

3. Appropriate water technologies > Point-of-use treatment systems which are now more widely available can be an effective method in treating water in de-centralized situations. For example residential and industrial buildings away from densely populated areas can be good candidates for utilizing such systems.

4. Desalination > Desalination should be considered to make –up the demand shortfall after all other methods have been utilized to their maximum benefit. Desalination alone in the absence of other measures is very expensive and could be damaging to the environment in many other ways.

5. Long-distance water transfer > Like desalination, long-distance water transfer could be very costly and should be considered as part of an overall solution which embodies measures for efficiency and reclamation/reuse to their maximum benefit first.

In addition to the above the age and quality of water distribution systems in Cyprus needs a great deal of improvement. Reducing leakage from distribution systems could save a significant amount of resources each year and is a relatively low-tech proposition before embarking on more costly projects.

Implementation of dual water systems can play a very important role in promoting reclamation and reuse of water.

In future consideration could also be given to more ambitious projects such as installing solar power panels above dams. This reduces evaporation levels significantly as well as providing a suitable low-cost location for solar projects in lieu of land resources.

Therefore, I am hoping that these proposals will receive attention and be adopted by the relevant ministries and other related government, semi-government organizations to deal with the impacts resulting from climate change in Cyprus and also to promote and maintain sustainable development therefore sustainable tourism (environment-economy-employment triangle) (Funda Zaim).

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17. Personal expertise and experience in water and waste water treatment and reclamation techniques and technologies