

JORDAN BADIA PROJECT

WATER PROVISION

We have already discovered just how important water is to the life in the Badia where precipitation is a rare event. People need water to survive and will obtain it by the easiest means possible. Traditionally water was obtained from the product of either snowmelt or flash floods. Such water was often harvested and stored in cisterns or behind small dams. Today these dams have generally fallen into disrepair in favour of piped water from underground 'fossil' water, which by its very nature cannot be sustainable.

FACT BOX E1 - PROVISION OF WATER SUPPLIES

Jordan's population growth runs at 2.1% (UK = 0.3%) while her available water supplies are diminishing both actually and as well as per capita. This is not helped by dam constriction and the abstraction of traditional water flows upstream and across international borders. Further there does appear to be a change in seasonal patterns generally attributed to climate change. The highest ground in the vicinity of the Badia lies in Syria (Jabal Al-'Arab), which means that the region is dependent upon surface and ground water flows from there. If winter snows are reduced the recharge to the aquifers is also reduced. The mountains are volcanic in origin with basaltic flows emanating from them. These flows allow easy absorption and passage of ground water such that desert surfaces may be arid except where accumulated clays provide natural impermeability. Sandy areas may be more impermeable than you may imagine. Moving sand erodes by attrition to produce a fine dust that may hold moisture. Thus while the surface may appear dry, the subsurface is damp about 15cm below. Surface stores of water may occur where wadis flow into natural depressions (*qa'a*) or behind small natural dams in a channel (*marab*). Such stores are temporary although there may well be sub-surface storage.

Throughout Jordan the potential evaporation rates exceed the precipitation. Given that Safawi's annual rainfall averages 70mm and the potential evaporation rate is around 3,600mm, which presents obvious problems long-term. Research¹ has shown that 89% of storms yielded less than 8mm and only about 4% yielded more than the 16mm required to produce significant run-off. 80.6% of Jordan receives less than 100mm/year. In general the open rangelands require 150 - 200mm/year to supply the plant growth for livestock grazing. The rainfall is very variable and unreliable (annual mean range: 10.9 - 213mm), which means that growing livestock numbers become increasingly difficult to feed on natural vegetation alone.

FACT BOX E2 - ILLEGAL WELLS

There are over 500 illegal wells in the Azraq area all of which are drawing from 'fossil' water created in wetter, glacial periods and over thousands of years of natural recharge from rainfall, snowmelt and flash floods.

JORDAN'S ARID BADIA

TASK 1: The reality of the situation

The Badia is a very dry area, which condition has in the past restricted the area's development. Your task is to produce graphs to be included later in a report.

Firstly we need to investigate what the climate is like. Monthly temperature and rainfall statistics should be made into a climate graph.

Here are the average statistics (1977 - 2005) for Safawi a small town in the heart of the Badia.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature:	8.1	9.8	13.4	18.3	23.0	26.8	30.7	29.1	26.7	21.8	14.8	9.9
Rainfall:	13.1	11.6	11.3	5.2	1.4	0.0	0.0	0.0	0.1	5.8	9.5	12.4

1: Use the graph below to produce a climate graph for Safawi.

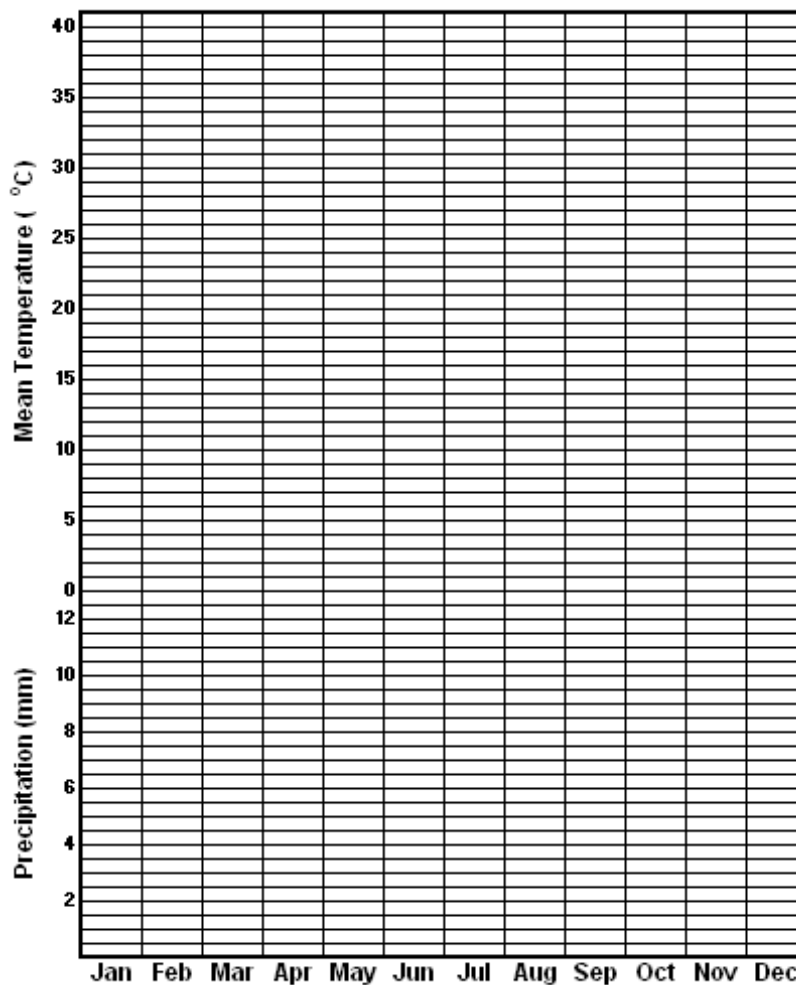


Fig.E1: Climate graph showing the mean temperature and rainfall for the town of Safawi

2: Once you have completed the graph. Write a description of what it shows and possible implications for water supply.

You may wish to consider

- ⌘ Why there are no permanently flowing rivers in the Badia.
- ⌘ Water does sometimes flow in the wadis (dry valleys) for short periods
- ⌘ Water on the surface is evaporated quickly.

3: Now consider the following information provided by the Jordanian Government (*our study area; see Fig. C4 for a map of Governorates)

	2002	2003	2004	2005	2006
Mafraq*	16.9	17.3	16.9	17.5	17.6
Zarqa	34.4	37.0	36.7	38.4	40.3
Amman	94.1	106.3	118.6	119.9	121.9
Ma'an	8.0	7.1	7.1	7.1	7.5
All Jordan:	245.7	258.8	276.0	282.2	286.3
% change:	+2.8	+5.3	+6.6	+2.2	+1.5

Fig.E2: Water Supply for Households and Municipal Purposes (Million cubic metres) for selected Governorates.

(Source: Statistical Yearbook - Jordan - 2007)

The information shows how much water is used by households and the local councils. Convert the data into an Excel Worksheet in the same way as above. Think of ways to display and analyse the information .

Points to consider

- ⌘ Most of the water usage is outside of the Badia. Why?
- ⌘ Water usage is still rising but its growth has reduced. Why?
- ⌘ Compare the situation with the graph in Figure E3 below.

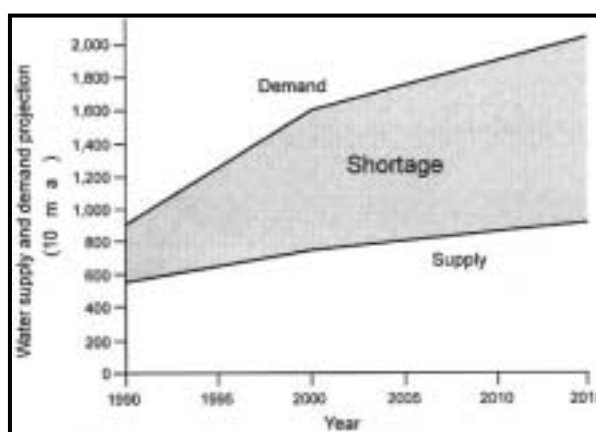


Fig.E3: Water supply and demand for Jordan projected from 1990 to 2015

(After USAID/Jordan,1992)

http://www.who.int/water_sanitation_health/resourcesquality/wpccasestudy12.pdf