

# EFFECTS OF WATER SCARCITY, FOOD PRODUCTION AND MIGRATION

## Effekt av vattenbrist på matproduktion och migration

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### Abstract

Recent UN reports show that most countries in northern Africa and the Middle East are facing water shortage. The percentage of renewable water resources withdrawn is extremely high. The population growth in most of these countries is estimated to be very high. Thus, the population is estimated to grow by 50 % in several countries the next 30 to 40 years and in some countries double or even triple. Since most of the available water is used for food production, the situation might become disastrous. Studies have shown that there is a correlation between poverty and inter and intra-state conflicts. In 2015 more than one million refugees came to Europe. This was only a small part of the total number of refugees, the majority remaining in the region. Given the hydrological situation and the estimated population growth, people will continue to try to escape from conflicts and poverty. Thus, the migration from northern Africa and the Middle East to Europe will most likely increase in the future. Efforts must be made not only to stop the ongoing conflicts. Large resources must be allocated to e.g. introduce more efficient use and reuse of the available water resources, cooperative water management, more effective large and small scale farming etc. The international community must make powerful efforts to counteract or at least mitigate the effect of this threatening situation to give people in northern Africa and the Middle East reasonable conditions to stay in their own countries.

*Key words* – Water scarcity; Irrigation; Food production; World population; Population increase; Migration

### Sammanfattning

Nyligen publicerade FN-rapporter visar att de flesta länderna i norra Afrika och Mellersta Östern lider av vattenbrist. Andelen av det förnybara vattnet som redan används är mycket hög. Befolkningstillväxten i de flesta av dessa länder beräknas bli mycket hög. Befolkningen beräknas öka med 50 % inom de närmaste 30 till 40 åren i flera av länderna och i vissa länder till och med dubbels eller tredubblas. Eftersom det mesta av det förnybara vattnet redan används för produktion av mat kan en sådan befolkningsökning bli katastrofal. Forskning har visat att det finns ett klart samband mellan fattigdom och konflikter. År 2015 kom mer än en million flyktingar till Europa. Detta var bara en liten del av det totala antalet flyktingar. De flesta blev kvar i regionen. Den hydrologiska situationen samt den förväntade kraftiga befolkningsökningen kommer att medföra att människor kommer att försöka fly från konflikter och fattigdom. Migrationen från norra Afrika och Mellersta Östern till Europa kommer därför med största sannolikhet att öka i framtiden. Ansträngningar måste göras för att stoppa pågående konflikter. Mycket stora resurser måste också tillföras för att effektivisera användningen av tillgängliga vattenresurser, introducera vattenplanering, mer effektiva jordbruksmetoder etc. Världssamfundet måste vidta kraftfulla åtgärder för att förhindra eller åtminstone mildra effekten av den hotande framtida situationen så att befolkningen i norra Afrika och Mellersta Östern får rimliga förutsättningar att stanna i sina egna länder.

### Introduction

“As sectarian tensions spearheaded by ISIS convulse the Middle East, and tensions between Iran and Saudi Arabia only deepen, it is hard to imagine that a far more

pressing concern could be threatening the region” (Bender, 2016). This quotation is one of several showing that the situation might be worsened due to water shortage (see e.g. IWMI, 2007, Särner, 2012 and UN Water, 2015).

A combination of population growth and water scarcity results in poverty and creates conditions for conflicts. The largest area facing water scarcity runs from northern Africa over the Middle East to the northern parts of China. The conditions are, however, not the same in the whole of this area. While e.g. China is expecting a decreasing population, a large part of countries in northern and eastern Africa, the Middle East and western Asia can expect a fast increasing population (UN, 2011). This will result in difficulties to feed the population.

Water scarcity can be defined in different ways (White, 2012). Normally, only renewable water is included, although in some cases a certain degree of recirculation can be included. However, if the access to water is classified as scarce, the situation is serious no matter what definition used.

## Access to water

Water is the most important resource on earth. Without water, human life is impossible. The water needed for survival is about 2–5 litres per person and day depending on what we do and the climatic conditions. However, food is also needed for survival. For vegetarian diet, 1000–2000 litres per person and day are needed. A meat diet requires 2 or 3 times as much. Of course, large variations occur depending on crops used, climatic conditions etc. Irrigation for food production accounts for about 70 % of the water used globally. Domestic water use, which accounts for only about 10 % of the water used globally, is normally in the range 20–500 litres per person and day, the highest number if potable water is

available at home and at no cost, the lowest if the water has to be fetched far away and carried home (IWMI, 2007).

A decade ago the International Water Management Institute, a none government organisation with its head office in Sri Lanka, showed that large areas in the world suffered due to water scarcity (IWMI, 2007). It was shown that the largest area covered northern Africa, the Middle East and a large part of Asia all across northern China. In the UN World Water Development Report 2015, the renewable water resources were shown (Figure 1). The water access is globally very uneven distributed. As can be seen, in most of the countries in northern and north-eastern Africa and the Middle East the water situation is classified as scarcity or absolute scarcity and in Asia as stress or vulnerability. Thus, in many countries the water available is already too low for the present population and in others close to this situation. The percentage of renewable water resources withdrawn is shown in Figure 2. In many of the countries this percentage is very high and can hardly be increased. It must be observed, however, that large local variations may occur. An example is Egypt, where the vicinity to the river Nile secures plenty of water, while the rest of the country suffers due to a deficit.

## Population development

The population growth in most of the countries in northern and north-eastern Africa, the Middle East and western Asia is estimated to be very high the following decades due to a very young population and a high fertility, even if the fertility is believed to decline. In

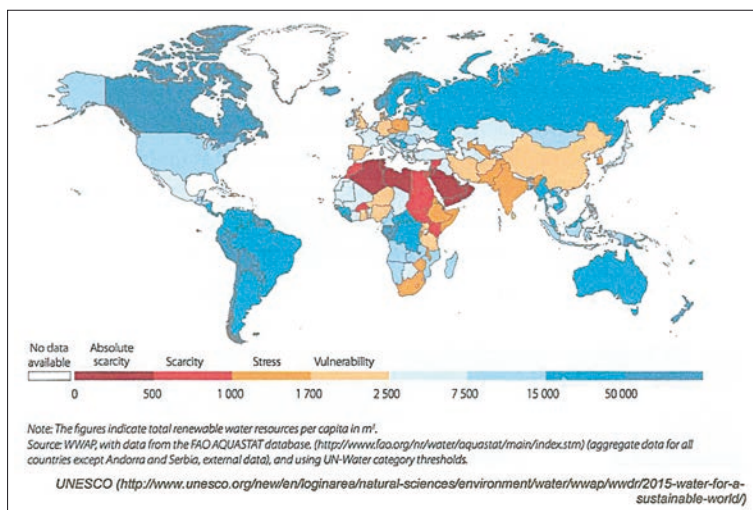


Figure 1. Total renewable water resources per capita 2013 (UN Water, 2015).

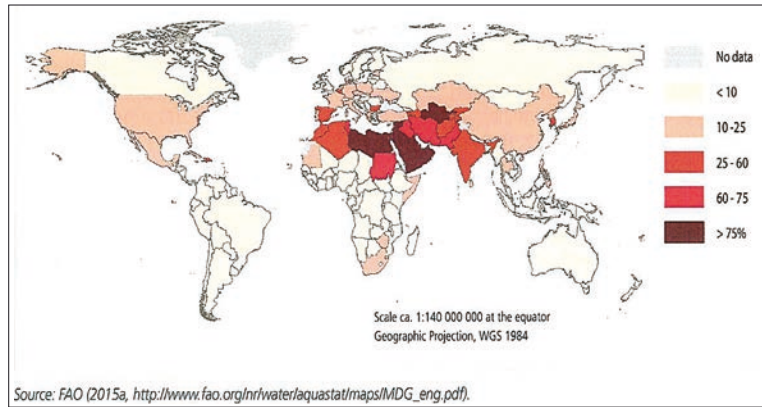


Figure 2. *Percentage of renewable water resources withdrawn (UN Water, 2016).*

Table 1, the forecasted increase in population from 2010 to 2050 is shown (UN, 2011). As can be seen, the expected increase in population is very high during a relatively short period of time. The reason is the very young population. Globally, the population under the age of

24 in the less developed countries is almost 50 % and in the least developed countries about 60 %. This can be compared to the corresponding number in the more developed countries, which is about 30 % (UN, 2011).

Table 1. *Expected population growth in some countries in northern and north-eastern Africa, the Middle East and western Asia from year 2010 to 2050 (data from UN, 2011<sup>\*</sup>).*

Globally, the total population is supposed to peak at 10–11 billions around the year 2100 (UN, 2011). The growth will almost totally be concentrated to Africa and Asia, while e.g. Europe will have a slightly decreased population.

| Country     | 2010  | 2050  | Increase, Milj. | Increase, % |
|-------------|-------|-------|-----------------|-------------|
| Mali        | 15.4  | 42.1  | 26.7            | 173         |
| Libya       | 6.4   | 8.8   | 2.4             | 38          |
| Niger       | 15.5  | 55.4  | 39.9            | 257         |
| Chad        | 11.2  | 27.3  | 16.1            | 144         |
| Egypt       | 81.1  | 123.5 | 42.4            | 52          |
| Sudan**     | 43.6  | 91    | 47.4            | 109         |
| Ethiopia    | 83    | 145.2 | 62.2            | 75          |
| Somalia     | 9.3   | 28.2  | 18.9            | 203         |
| Syria       | 20.4  | 33.1  | 12.7            | 62          |
| Iraq        | 31.7  | 83.4  | 51.7            | 163         |
| Iran        | 74    | 85.3  | 11.3            | 15          |
| Afghanistan | 31.4  | 76.3  | 44.9            | 143         |
| Pakistan    | 173.6 | 274.9 | 101.3           | 58          |
| Europe      | 738.2 | 719.3 | -18.9           | -3          |
| World       | 6900  | 9300  | 2400            | 35          |

It must be pointed out that the population growth as presented in the report published by UN (UN, 2011) spans over 100 years. Such a forecast is of course afflicted with a large uncertainty. In a shorter period of time – 30–40 years – it ought to be more accurate. Large deviations might however occur due to e.g. large scale conflicts/wars. This is probably the case for e.g. Syria, Iraq and Libya. Neighbouring countries might also be affected if the conflict is lasting for a long time, since refugees might settle in these countries. This could also be the case for some countries in Europe, where large number of refugees have been accepted.

The forecasted population in most of the countries in northern and north-eastern Africa, the Middle East and western Asia will probably never reach the figures in the prognosis published by UN. The reason is that it will not be possible to feed this population. This means that the population will reach a level, at which the living conditions are so repulsive that poverty and starvation followed by conflicts and migration will be at hand.

\* Calculations using four different assumptions regarding changes in fertility were made in the prognosis published by UN. In this table, the so called “medium calculation” has been used, which is believed to give the most realistically forecast. Here, the fertility is assumed to follow the fertility change that occurred in developed countries until “replacement fertility” was reached.

\*\* Sudan was in 2011 divided into two countries. The southern country – South Sudan – had at that time about 9 million inhabitants.

## Conflicts due to water scarcity

Access to water is the most fundamental prerequisite for human life. Thus, if there is a scarcity of water, humans will compete for this vital resource. Lack of water will also result in difficulties to feed the population, poverty,

poor or no education and lack of resources for other human needs. This is a hotbed for conflicts and extreme political and religious organizations. There are strong indications that lack of water has been the reason for large scale conflicts (Schelin, 2011, Kelley et. al., 2015).

Technology for desalination of sea water has been suggested to solve the problem with water scarcity and such technologies are also used. To be able to desalinate sea water in large scale, however, reverse osmosis seems to be the only realistic method. Unfortunately, this method is expensive, and one of the reasons for this is that the membranes used are blocked due to growth of microorganisms. Expensive chemical cleaning must be applied, but relatively soon the membranes must be replaced by new ones. A pre-treatment method has however been developed, which extends the membrane lifetime and the total cost is reported to be less than 60 US cent per m<sup>3</sup> (Jacobsen, 2016). Although suitable for domestic water supply, this is unfortunately in most cases too costly for water used for irrigation, at least in large scale. Other methods are available for desalination, but the problem is to apply the methods in large scale and the cost.

With the present situation with water scarcity in northern and north-eastern Africa, the Middle East and western Asia in combination with a large and fast growing population, the situation in several of the countries in this region might become disastrous. If nothing is done to prevent or mitigate the situation, it will most probably result in increased poverty including starvation and conflicts between different clans and countries. It will also result in large scale migration.

## Discussion

Unless powerful actions are taken by the international community, the situation for the inhabitants in northern and north-eastern Africa, the Middle East and western Asia might become disastrous in the near future due to water shortage and a high increase in population. The difficulties to feed the population will result in poverty and starvation and this will most probably lead to inter and intra-state conflicts and large scale migration. The migration will not be limited to the neighbouring countries. A large scale migration to Europe can be expected, which can be considerably larger than what has been the case previous years.

Efforts must be made not only to stop the conflicts in the area, although this is a prerequisite for other measures to be introduced. Other measures must be applied in large scale, such as:

- More efficient methods for water use and reuse must be introduced.
- Regional and in some cases inter-regional water management systems must be implemented.
- More resources should be allocated to develop cheap, large scale methods for desalination of seawater.
- More effective farming methods and more suitable crops must be introduced.
- Larger effort must be made for family planning.

Furthermore, more resources must be given to the refugee camps in the vicinity of the conflict areas, which will make it easier for the refugees to return when the conflicts are over. Of vital importance is to give children in the camps education. If not, a whole generation might “be lost”.

If the international community make powerful efforts in these areas, the menacing situation could be obstructed or at least mitigated. If not, human suffering will be indescribable and consequences will be noted far outside northern and north-eastern Africa, the Middle East and western Asia.


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