WORLD BANK WORKSHOP ON CLIMATE RISKS AND VULNERABILITIES OF ALBANIA'S ENERGY SECTOR

WORKSHOP BRIEFING NOTE

1. What trends in Albania's climate have been observed?

Figure 1 shows trends in average annual temperatures at various Albanian cities from 1961 to 2000. In general, a decreasing trend was observed until the mid-1980s, and temperatures have been increasing since then. In the last 15 years, a positive temperature trend has been observed at almost all meteorological stations. Since the 1980s, the numbers of very hot days (when temperatures exceeded 35°C) has increased, whereas the numbers of very cold days (with temperatures below -5°C) has decreased. These recent increases are in line with global trends. According to the IPCC Fourth Assessment Report (2007), eleven of the twelve years from 1995 to 2006 rank among the twelve warmest years in the instrumental record of global surface temperature (since 1850).

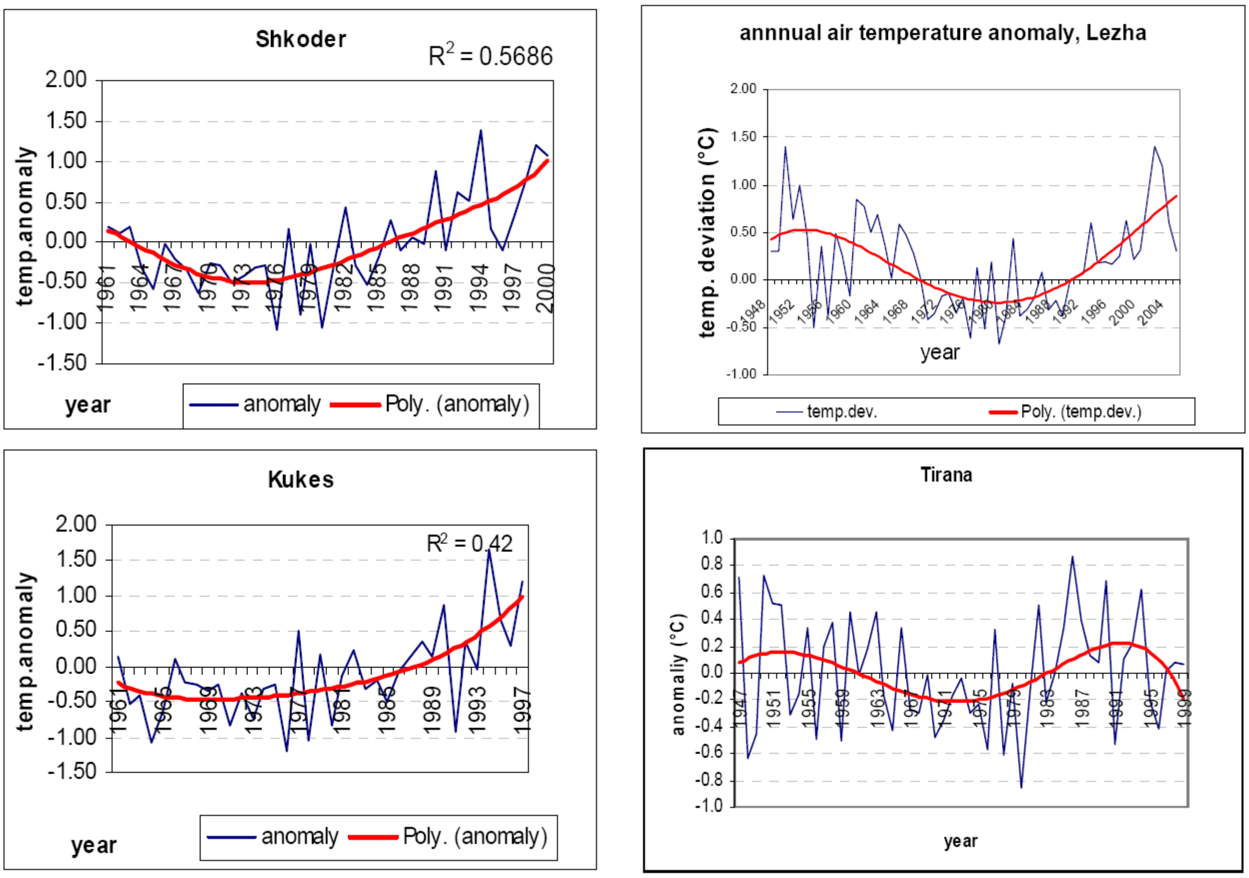

Figure 1: Temperature trends from 1961 – 2000 in selected Albanian cities. [Source: Bruci, E. *Climate variability and trends in Albania*, Institute of Energy, Water and Environment, Polytechnic University, 2008]

Figure 2 shows the trend in annual precipitation across Albania from 1961 – 1990, based on data recorded at 22 stations across the country. In general, annual precipitation across Albania decreased over this period. The decreasing trend is significant for the Ishmi River basin, in the downstream basin of the Mat River and in the upper part of the Vjosa River basin. In the northern Albanian Alps, a slight positive trend is observed, but this is not significant.

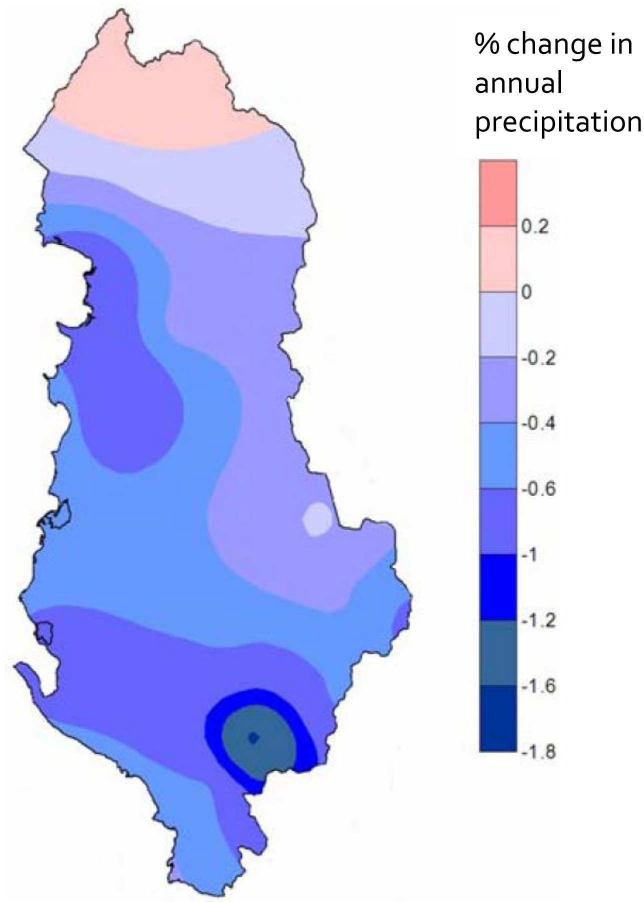

Figure 2: Trends in annual precipitation (%) from 1961 – 1990 across Albania. (Blue colours represent a reduction in precipitation). [Source: Bruci, E. *Climate variability and trends in Albania*, Institute of Energy, Water and Environment, Polytechnic University, 2008]

2. What future changes in climate are projected?

Projected climatic changes in Albania over coming decades (see Figures 3 and 4) include:

- Increased average temperatures, with increases of 1 to 2°C by the 2020s and 2 to 3°C by the 2050s, compared to the present day,
- Increased risk of heat-waves,
- Decreased annual average precipitation, with summers showing the greatest seasonal decrease,
- Increased risk of intense precipitation events, with consequent increased flash flood risk,
- Sea level rise in coastal areas, leading to increased flood risks.

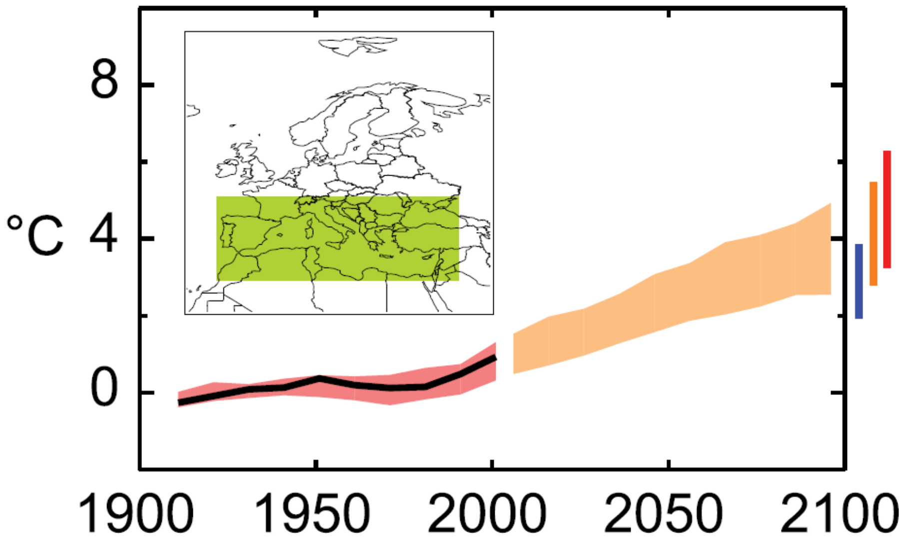

Figure 3: Changes in temperatures (relative to 1901-50) across southern Europe: Observed from 1906-2005 (black line), simulated by IPCC AR4 climate models (red envelope), and projected from 2001-2100 by IPCC AR4 climate models, for the A1B emissions scenario (orange envelope). [Source: IPCC Fourth Assessment Report, Working Group 1, 2007]

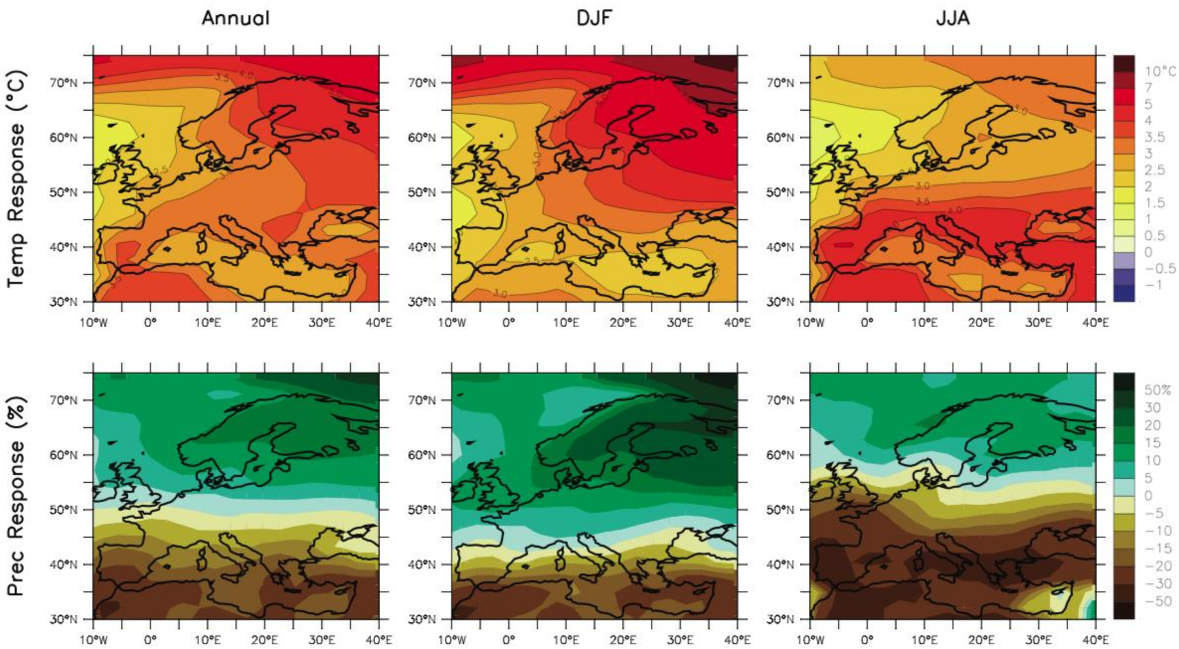

Figure 4: Projected changes in temperature and precipitation over Europe across a range of climate models under the A1B greenhouse gas emissions scenario. Top row: Annual mean, winter (DJF) and summer (JJA) temperature change between 1980 to 1999 and 2080 to 2099, averaged over 21 climate models. Bottom row: same as top, but showing percentage change in precipitation. [Source: IPCC Fourth Assessment Report, Working Group 1, 2007]

3. Potential impacts of climate change on the energy sector

Most of Albania's energy infrastructure has been built to design codes based on historic climate data. Older assets will require decisions in coming years regarding rehabilitation, upgrade or replacement. This poses both a challenge and an opportunity in relation to climate change.

Albania's First National Communication to the United Nations Framework Convention on Climate Change (2002), highlighted some key vulnerabilities of the country's energy sector. The National Communication identified the effects of rising temperatures on energy demand for space heating, space cooling, water heating and refrigeration. It estimated that rising temperatures could lead to a reduction in energy demand for space heating in the residential sector of between 12% - 16% by 2025, compared to the 1990 baseline. But energy demand drivers are clearly not limited to temperature, with precipitation, wind speed and cloud cover also being important factors.

Some of the climate vulnerabilities and potential risks to energy assets in Albania can be summarised as follows:

- Albania's reliance on hydropower makes the country vulnerable to severe drought.
- During droughts, power cuts are common and have significant impacts on the economy. Projections of drier conditions could lead to reduced hydropower potential in the country.
- Precipitation changes can also affect sediment loads, potentially leading to increased requirements for dredging or reduced output from hydropower facilities, if dredging is not undertaken.
- Thermal power plants may also be vulnerable to climate change, through reductions in availability of water for cooling and reduced efficiencies of turbines under conditions of higher temperature and relative humidity.
- Assets located on the coast could be vulnerable to rising sea levels.
- Solar and wind power are sensitive to changes in sunshine hours (cloud cover) and wind speeds.
- Extreme climatic events can affect electricity transmission; disrupt oil and gas production and impact the integrity of transmission pipelines.

Glossary

Adaptation
Actions to reduce the vulnerability of natural and human systems to climate change effects. For instance, an adaptation action that can be taken to reduce the damaging effects of rising sea levels is to build higher sea defences. Various types of adaptation exist, e.g. anticipatory and reactive, private and public, and autonomous and planned.

AR4
The Fourth Assessment Report of the IPCC, released in 2007.

Baseline
The reference against which change is measured, e.g. 'baseline climate' is normally defined as the period 1961-1990.

Carbon dioxide (CO_2)
CO_2 is a naturally occurring gas, and a by-product of burning fossil fuels or biomass, of land-use changes and of industrial processes. It is the main greenhouse gas produced by man that is driving climate change.

Climate change
Climate change refers to any change in climate that lasts for an extended period, typically decades or longer, whether due to natural variability or as a result of human activity.

Climate hazards
Climate variables which have consequences for the system being studied (in this case, Albania's energy sector). The main climate hazards to be discussed at the workshop are temperature, precipitation, relative humidity, sunshine, winds, sea level rise and extreme events such as storms.

Climate impacts
The effects that climate hazards have on a given system (in this case, Albania's energy sector), e.g. reductions in rainfall have impacts on hydropower generation.

Climate variability
Climate variability refers to variations in the average state of climate. Rainfall, for instance, has high natural variability, which makes it difficult to detect a climate change signal.

General Circulation Models / Global Climate Models (GCMs)
A computer-based numerical model of the climate system. GCMs are developed and run by climate modelling centres around the world and are used to project changes in climate.

Greenhouse Gases (GHGs)
Greenhouse gases absorb and emit infrared radiation. This property causes the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary greenhouse gases in the earth's atmosphere.

Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change was formed in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), and is the international advisory body on climate change.

Mitigation

Actions to reduce man-made effects on the climate system. These include actions to reduce emissions of greenhouse gases (such as energy efficiency measures or the use of renewable energy resources), as well as actions to increase greenhouse gas sinks (such as planting forests).

Risk

Risk is the product of the *likelihood (or probability) of an event* occurring and the *magnitude of its consequence*.

Scenario

A plausible description of how the future may develop. Scenarios are not predictions or forecasts, but are useful to provide a view of the implications of actions.

Sensitivity

Sensitivity is the amount by which a system is affected, either adversely or beneficially, by climate variability or climate change. For instance, the efficiency of gas turbines is sensitive to temperature. As temperatures rise, efficiency falls.

Special Report on Emissions Scenarios (SRES)

To provide a basis for estimating future climate change, the IPCC prepared the Special Report on Emissions Scenarios in 2000. It provides 40 greenhouse gas and sulphate aerosol emission scenarios based on different assumptions about demographic, economic and technological factors. The emissions scenarios are fed into Global Climate Models, to project future changes in climate.

Threshold

A property of a system where the relationship between the input and the output changes suddenly. For example, the height of a flood defence represents a critical threshold – if water levels exceed the defence height, flooding will occur. It is important to identify climate-related thresholds as they indicate rapid changes in the level of risk.

Timeslice

Projections of climate change are usually given for three timeslices – the 2020s, 2050s and the 2080s. The projections are a 30-year average, centred around each of the given timeslices, (ie. the 2020s is 2010 – 2039). Climate models cannot predict what the specific climate will be in any given year, due in part to the inter-annual variability of climate variables, so the projections are 30-year averages of future climate.

Uncertainty

An expression of the degree to which a value is unknown (e.g. the future state of the climate system). Uncertainty can result from lack of information or from disagreement about what is known or even knowable.