American Water Resources Association
2009 SPRING SPECIALTY CONFERENCE
Managing Water Resources Development in a Changing Climate
May 4-6, 2009
Anchorage, AK

Wednesday, May 6
10:30 AM – 12:00 Noon
Session 29: Water Supply Management II

1. Onsite Graywater Reuse: Treatment and Climate - Joe Yelderman, Baylor University, Waco, TX (co-author: Nathan Griswell)

The need for methods to conserve, reuse, and treat domestic water may be one of the greatest future challenges in the face of changing climates. In the United States onsite wastewater is a combination of blackwater (sewage) and graywater (wash water). However, in many countries the blackwater is separated from the graywater making the treatment easier for both and improving the potential reuse of graywater which has fewer associated pathogens and health risks. This study developed and tested a sand filter treatment system for graywater that is relatively inexpensive to construct from generally available local materials. These conditions were chosen to insure the system would be practical in a variety of settings world wide. The tests were conducted under two different climatic conditions with respect to rainfall. The reductions in CBOD5, TSS, N and P were compared with arid conditions followed by wet conditions and then for wet conditions followed by arid conditions. The gray water used in the experiment was made from a formula developed after reviewing the literature and visiting several third world countries where the graywater is separated but not treated. Although only a small step toward understanding the problem, the results are thought to provide help in developing treatment systems that will promote practical wastewater effluent reuse within a variety of climatic conditions.

2. Water And Salinity Management With Blending, Desalination, Conveyance, Conservation, Waste-Water Treatment And Reuse To Counteract Climate Variability In Gaza - David Rosenberg, Dept. of Civil and Environmental Engineering and Utah Water Research, Logan, UT (co-author: Ahmed Al-Jaidi, Jagath J. Kaluarachchi)

We include demand for and blending of water of different salinity concentrations as input parameters and decision variables in a regional hydro-economic optimization model. We then use stochastic non-linear programming to jointly identify the benefit maximizing set of infrastructure expansions and operational allocations under climate variability. We present a detailed application for 5 districts in the Gaza Strip, Palestine. The application considers building desalination, blending, and waste-water treatment plants, initiating water conservation and leak reduction programs, plus allocating and transferring water of different qualities among agricultural, industrial, and urban sectors and among districts. Results show how to integrate a mix of supply enhancement, conservation, and water quality improvement actions into a portfolio that can economically and efficiently respond to changes and uncertainties in surface and groundwater availability due to climate variability. We also show how to put drawn-down and saline Gaza aquifer water to more economical use.

3. Comparing Methods to Investigate the Impacts of Climate Change - Luc Roy, Hydro-Quebec / Ouranos, Montreal, QC Canada (co-authors: Georges Desrochers, Rene Roy, Guenther Pacher, Frédéric Guay, Dominique Tapsoba)

Quebec has an installed electric generation capacity of over 40,000 megawatts (MW), 96% hydroelectric, supplying 40 % of its total energy requirements. More than 80 % of this electricity originates from hydroelectric plants located north of the 50th parallel, in the Boreal region. The other 20 % of the electricity is coming from hydro power plants located in the southern part of the province on the Saint-Laurent River watershed. From the perspective of both economics and Quebeckers' energy security, it is clearly important to determine the impacts of climate change on the currently installed generation capacity. This must also be borne in mind when planning future facilities, since the time constants of climate change correspond closely with the planning horizon for large hydroelectricity stations. We recognize the necessity of making considerable efforts to better understand the global conditions that determine runoff and to develop tools and models allowing us to foresee the impacts of climate change on the hydrological regime of Québec's

developed watersheds and to elaborate adequate adaptation strategies over the upcoming decades. This paper presents the results of an impact analysis of climate change on the hydrological regime of up to an hundred watersheds located in Quebec, CANADA. We have been using, as inputs to a conceptual lumped hydrological model, more than 80 climate projections being used in the Fourth assessment Report of the IPCC. The hydrological simulations at the 2050 time horizon were compared to the one simulated for the reference period (1961-1990). We have analyzed the evolution of the mean annual inflow as well and their variability, together with some spring freshet characteristics. This analysis was performed using three different methods; the so called widely used “Perturbation Method” and the Direct Method (with and without climate data bias correction). Given these results and knowing the advantages and drawbacks of the different methods, we recommend, for further analysis, to consider the Direct Method for evaluating the impacts of climate change on water resources availability.