

Restoration of the Salton Sea Using Solar Still Distillation

Victor Miguel Ponce, Sudhir Kumar and Rajendra P. Pandey,

Revista de Estudos Ambientais, Blumenau, vol. 2 no. 2-3, 96-102, May/Dec 2000

(Jour. on Review of Environmental Studies, Santa Catarina Brazil)

The Salton Sea is the largest lake in California, encompassing 979 km³ (378 ml²) in Imperial and Riverside countries, in the southeastern portion of the state. The lake is used as a repository for agricultural wastewater from the neighbouring Imperial and Coachella valleys. The wastewater has a high concentration of dissolved solids, up to 3.6 ppt. The lake is threatened by rising salinity, which currently exceeds 44 ppt. The restoration proposal uses solar still distillation to separate the salts from the water. The distilled water is either returned directly to the lake or commercialized to control the lake level. The salts can be exported for ultimate disposal in the high seas.

Design Flood Estimation Using GIS Supported GIUH Approach

Jain S.K., R.D.Singh and S.M.Seth

Water Resources Management 14 369-376, 2000

Quantitative understanding of the processes of runoff generation and its transmission to the outlet represent one of the most basic and challenging areas of hydrology. Traditional techniques for design flood estimation use historical rainfall-runoff data for unit hydrograph derivation. They have been widely applied for the estimation of design flood hydrograph at gauged catchment. For ungauged catchments, unit hydrograph may be derived using either regional unit hydrograph approach or alternatively Geomorphological Instantaneous Unit Hydrograph (GIUH) approach.

In this study Gambhiri dam catchment located in Rajasthan, India is selected. Gambhiri River is a small tributary of the Berach/Banas river of the Chambal basin. The objective of the present study is to apply Geographical Information System (GIS) supported GIUH approach for the estimation of design flood. From this study it is observed that the peak characteristics of the design flood are more sensitive to the various storm pattern as well as method of critical sequencing followed for the computation of design storm patterns. Earlier estimates for the peak and time to peak hydrograph was 9143.74 cumec and 18 hrs. respectively. However, the

estimates for the peak characteristics of design flood hydrograph obtained from the GIUH based approach are 11870.6 cumec and 19 hrs. respectively considering the same design storm pattern.

Numerical Simulation of Impact of Bores Against Inclined Walls

Mohapatra P.K., S.Murthy Bhallamudi and V. Eswaran

Journal of Hydraulic Engineering, Vol.126, No.12, December 2000.

The work presents numerical simulations for the analysis of the impact of a bore against a wall. The 2D governing equations in the vertical plane are solved numerically using a variant of the simplified marker and cell method. Results are obtained for the maximum force and the runup height of the wall. Numerical results for the case of the vertical wall compare well with the previous experimental data. A parametric study for the maximum force and the runup height on an inclined wall is presented.

Application of Chemical Mass Balance Approach to Determine Nutrient Loading

C. K. Jain

Hydrological Sciences Journal, 45(4), 577-588, 2000.

The river Kali in western Uttar Pradesh, India is a typical water course for untreated municipal and industrial effluents. The river receives considerable amount of waste every day from the industries and municipal area of Muzaffarnagar town. Agricultural runoff is the another major factor for the pollution of the river water. The mass balance calculations conducted on the river reach indicated that nitrate and phosphate from the non-point sources constitute 32.4 and 11.2 percent of the total load, respectively. The resulting differential loading, if adjusted for uncharacterized non-point contribution to the load, may represent the total point sources load to the river minus any losses due to volatilization, settling, and/or degradation. Indirect monitoring using upstream/downstream sampling locations provides a viable alternative for measuring the changes in the concentration and/or load to the river.

Arsenic : Occurrence, Toxicity and Speciation Techniques

C. K. Jain and Imran Ali,

Water Research, 34(17), 4304-4312, 2000.

The occurrence of arsenic in natural water has received significant attention during recent years. Arsenic exists in the environment in a number of valency states. The valency state of arsenic plays an important role for its behavior and toxicity in the aqueous system. The toxicity and bioavailability of arsenic can only be determined if all its forms can be identified and quantified. Therefore, the aim of this article is to provide a general description of the occurrence of arsenic in the environment, its toxicity, health hazards, and measurement techniques for speciation analysis. Different techniques used for speciation of arsenic, viz., spectrometric, chromatographic, electrochemical, etc. have been discussed.

Adsorption of Cadmium on Riverine Sediments : Quantitative Treatment of the Large Particles
C. K. Jain and Imran Ali

Hydrological Processes, 14, 261-270, 2000.

The effect of solution pH, sediment dose, contact time, and particle size on the adsorption of cadmium ions on bed sediments have been studied for a highly polluted river in western Uttar Pradesh, India. The role of the coarser sediment and the clay and silt fractions has been examined. The optimum contact time needed to reach equilibrium is of the order of 30 and 60 minutes for 0-75 and 210-250 μm sediment size, respectively. The extent of cadmium adsorption increases with increasing pH and adsorbent doses and decreases with adsorbent particle size. The important geochemical phases, iron and manganese oxide, act as the active support material for the adsorption of cadmium. The competitive experiments conducted in the presence of lead and zinc ions indicate that both the ions suppress the ability of cadmium to adsorb onto sediments. The Langmuir and Freundlich adsorption models were used to determine the mechanistic parameters associated with the adsorption process.

Modelling Soil Erosion in Epic Supported by GIS

Jain S.K. and F.Dolezal

Journal of Environmental, Volume 8, paper 2, 2000

In the present study Environmental Productivity Impact Calculator (EPIC), a complex semi-empirical environmental model with distributed parameters, was used to estimate water erosion on 18 fields of a small (1.42 km²) agricultural catchment called Cernici in a foothill region of Central Bohemia, Czech Republic. Some input data for EPIC (areas, elevations, lengths and slopes) and the field-to-field sediment delivery ratios were prepared using GIS. Average

erosion rates predicted by EPIC were highest in May to September if USLE was used while MUSLE (modified USLE) and AOF (Onstad-Foster method) indicated high erosion rate also in December-January. The largest simulated soil erosion rates were found on few ploughed fields on which a prone-to-erosion crop rotation unfavourably combined with high field slope and highly erosive weather. A change of the crop rotation helped reduce the erosion.

Characterization of Drought Across Climatic Specrum

Victor M. Ponce, Rajendra P. Pandey, and Sezar Ercan

Journal of Hydrologic Engineering, vol. 5, No. 2, pp 222-224, April, 2000

A conceptual model of drought characterization across the climatic spectrum is formulated. The model is particularly suited to subtropical and midlatitudinal regions. Drought duration, intensity, and recurrence interval are expressed in terms of the ratio of mean annual precipitation to annual global terrestrial precipitation. The model is useful as a framework for the systematic analysis of droughts and assessment of changes in drought characteristics due to climatic changes.

Use of Recession Characteristics of Snowmelt Hydrographs in Assessment of Snow Water Storage in a Basin

Singh P, H Huebl and H W Weinmeister

Hydrological Processes, Vol. 14, pp. 91-101, 2000

For a better management of water resources, the information on water stored in a basin in the form of snow is of immense use. Changes in the snow water storage with time influence the recession characteristics of the hydrographs. Recession is found to be slower in a basin when it contains higher snow water storage and becomes faster as the volume of stored water reduces. In other words, the recession coefficient is not constant throughout the melt season, it changes with time. In the present study, the possibility of assessing snow water storage at any time during the melt season using recession coefficients are examined. The hydrograph analyses have been made for the Glatzbach watershed in the Hohe Tauern region of the austrian alps. For this purpose, a relationship between snow water storage and the recession coefficients is developed. This study suggests a simple and useful approach to assess the snow water storage in a basin at anytime during the snowmelt season. The information on the snow water storage of a basin can be obtained using a readily derived single parameter, the recession coefficient. The results are based on limited data, but they are sufficient to illustrate how the

changes in snow water storage control the recession characteristics of the hydrographs. These investigations set the pace for further research in this area.

Degree-Day Factors for Snow and Ice for Dokriani Glacier, Garhwal Himalayas

Pratap Singh, Naresh Kumar and Manohar Arora

Jour. of Hydrology, Vol. 235, pp. 1-11, 2000

In the present study, degree-day factors for snow and ice were determined over Dokriani glacier located in the Garhwal Himalayas. The field experiments were made at an altitude of about 4000m. Effect of a thin fine dust layer on both degree-day factors was also examined. Average values of degree-day factor for clean and dusted snow were computed to be 5.7 and 6.4 mm°C-1d-1, respectively, whereas for clean ice and dusted ice the value of this factor was found 7.4 and 8.0 mm°C-1d-1. The degree-day factor for clean ice was about 30% higher than that for clean snow. The presence of dust increased the degree-day factor for snow by about 12%, whereas for ice this factor was increased by about 9%. These observations suggest that the effect of dust on degree-day factor for snow is more pronounced than that for ice.

Correlations Between Discharge and Meteorological Parameters and Runoff Forecasting from a Highly Glacierized Himalayan Basin

Pratap Singh, K. S. Ramasastri, Naresh Kumar & Manohar Arora

Hydrological Sciences Jour., Vol. 45, pp. 637-652, 2000.

To assess the predictive significance of meteorological parameters for forecasting discharge from the Dokriani Glacier basin in the Himalayan region, discharge autocorrelation and correlations between discharge and meteorological factors were investigated on a monthly and a seasonal basis. Changes in correlations between discharge and meteorological variables, lagged by 0-3 days, were determined. Discharge autocorrelation was found to be very high for each individual summer month and for the melt season as a whole. This suggests that a substantial meltwater storage in the glacier, which results in a delayed response of runoff, and therefore discharge, from the highly glacierized basins is very much dependent on the previous day's discharge. A comparison of correlations between discharge and temperature, and discharge and precipitation shows that temperature has a better correlation with discharge during June and September, while precipitation has good correlation with discharge in July and August.

Setting Up Stage-Discharge Relations Using ANN

S K Jain and D.Chalisgaonkar

Journal of Hydrologic Engineering, ASCE, Vol 5, No.4, pp. 428-432, 2000

The Artificial Neural Networks (ANNs) that try to mimic the functioning of the human brain are a powerful tool for input-output mapping. The setting up of a stage-discharge relation is an important part of the processing of streamflow data. Three-layer feedforward ANNs have been used to model river-rating curves. The results show that the ANN approach is much superior as compared to the conventional curve-fitting approach. The ANN is also able to model a loop-rating curve (hysteresis effect) very well.

Estimation of Soil Erosion and Sediment Yield Using GIS

Manoj K. Jain, Umesh C. Kothiyari

Hydrological Sciences Journal, 45(5), pp. 771-786, 2000

A Geographical Information System (GIS) based method is proposed and demonstrated for the identification of sediment source areas and the prediction of storm sediment yield from catchments. Data from the Nagwa and Karso catchments in Bihar (India) have been used. The Integrated Land and Water Information System (ILWIS) GIS package has been used for carrying out geographic analyses. An Earth Resources Data Analysis System (ERDAS) Imagine image processor has been used for the digital analysis of satellite data for deriving the land cover and soil characteristics of the catchments. The catchments were discretized into hydrologically homogeneous grid cells to capture the catchment heterogeneity. The cells thus formed were then differentiated into cells of overland flow regions and cells of channel flow regions based on the magnitude of their flow accumulation areas. The gross soil erosion in each cell was calculated using the Universal Soil Loss Equation (USLE) by carefully determining its various parameters. The concept of sediment delivery ratio (SDR) was used for determination of the total sediment yield of each catchment during isolated storm events.

Rate and Volume of Stream Depletion During Pumping

Singh S K

Journal of Irrigation and Drainage Engineering, ASCE, pp.336-338, Vol. 126, No.5, 2000

The two analytical solutions researched by Theis, and also Glover and Balmer, for the rate of stream depletion are shown to be the same in the mathematical sense by solving the integral

appearing in the Theis solution. Expressions for the volume of stream depletion expressed as a fraction of total volume pumped relative to the rate of depletion are obtained for pumping and recovery. The optimum location of a well near the stream and the time to reach equilibrium are suggested.

Simple Method for Confined Aquifer Parameter Estimation

Singh S K

Journal of Irrigation and Drainage Engineering, ASCE, pp. 404-407, Vol. 126, No. 6 , 2000.

Early drawdown data, for which the argument m of the well function is >0.01 , have often been considered unimportant in evaluating aquifer parameters. This paper shows that these early drawdown data, especially in the neighborhood of $m = 0.43$, can yield accurate values of aquifer parameters. A simple method has been presented for explicit determination of aquifer parameters using early drawdown data. The method does not require curve matching, initial guess of the parameters, or special care to check for $m < 0.01$, and the computations involved can be performed on a calculator. Application of the method on published data sets shows that the estimates of the aquifer parameters using only a few initial drawdowns are as good as those obtained by Theis curve matching when all data, including the late drawdowns ($m \leq 0.01$), are used. The new method converges with the Cooper-Jacob method when the late drawdown data are considered. Thus, the late drawdown data also can be analysed using the new method.

Digital Image Processing for Determining Drop sizes from Irrigation Spray Nozzles

Sudheer K P and R K Panda

Agricultural Water Management, pp.159-167, Vol.45, No.2, 2000

All the existing methods for measuring drop sizes produced by a sprinkler nozzle are cumbersome, expensive or time consuming. Moreover, none could quantitatively express the relationship between drop size distribution and sprinkler head parameters viz. operating pressure and nozzle size. In the present study digital image processing technique has been applied to determine the drop size distribution from an irrigation spray nozzle. Image processing is the technique of automating and integrating a wide range of processes used for the human vision perception. The present study revealed that image-processing technique can be successfully implemented for drop size measurement accurately. Being a novel technique,

the method has some limitations for adaptation. These limitations can be very well contained through further research.