

Investigation of Wetland Performance for Sewage Treatment in Rural Areas

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ABSTRACT

Sewage before treatment causes harm to the environment through pollution of water, soil, air sources and all things that matter for better living. Infection through crude sewage disposal in the environment can cause epidemic and spread of dangerous diseases. Further, it also infects water and soil sources through organic and mineral substances and heavy metals, which can cause irrecoverable damage through diseases like cancer in humans and animals in the long run. Sewage treatment leading to recyclable water for agricultural use affords and green space. This is of extraordinary importance in arid regions because of finite amount of recoverable water even in rainy years.

Keywords: Sewage, Environment, Heavy Metals

INTRODUCTION

Nowadays there exists an expanded range of sewage systems that can be used for sewage treatment. However, there are major problems with some of the commonly used mechanized systems for sewage treatment, such as high cost of construction, high level of energy consumption, requirement of sludge disposal, and use of high technology for complicated utilization and treatment. Construction of advanced refineries in rural areas aren't welcomed because of lack of specialists for utilization and high cost of construction. The objective of this article is to introduce a suitable system to construct sewage treatment in rural areas.

Sewage treatment by the wetland method is much more affordable. Annual fees, such as

fund, utilization, repair and maintenance and depreciation are low for this method. Utilization is quite and the only mechanical appliances are pumps and piping for sewage transport. Artificial wetlands have been introduced for 60 years, especially in the last 30 recent years, and the tendency to use this technology is easily available. Unfortunately, many developing countries are turning to high technologies used in developed countries instead of inexpensive and locally suitable systems. Further, due to the many problems associated with technologies, the users are confronted with many problems, such as utilization, maintenance, high power consumption, etc. However, because of lack of efficiency and power requirements of these systems, natural systems are noticeable these days in developed countries.

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Wetlands are used as a secondary purification unit and are usually constructed after dirt stuck, piece stuck and primary settlement units and

wetland treatment process is illustrated in figure (1).

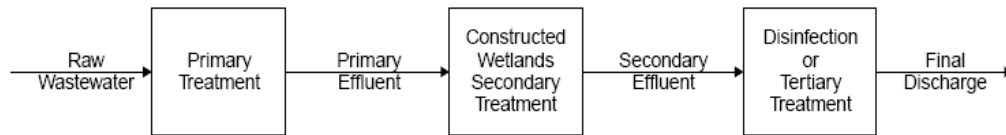


Figure1. Process of wetland treatment

Wetlands are divided into two groups:

- 1- Natural wetlands
- 2- Artificial wetlands

In natural wetlands, plants such as straw and etc. grow automatically in stored sewage such as swamplands and sewage is treated uncontrolled. Artificial wetlands are designed systems which were presented in the 1950s in West Germany. Artificial wetlands are of two types:

- 1- Artificial wetlands with surface flow where the liquid surface is in touch with air and which use soil and other suitable environment to raise plants.
- 2- Artificial wetlands with sub-surface flow where the liquid flow is under the surface of sand or gravel.

In the surface method, sewage flows on the ground surface. This method is not recommended because of problems, such as mosquitos and flies that growing and the production of smell in many areas. In the sub-surface method, sewage goes through the layers below the surface and surface of wetland may be completely dry. This method doesn't have those mosquitos and flies growing and smell production problems. The sewage entering the wetland should be pre-treated through the settlement. Components of an artificial wetland system are as shown in figure (2).

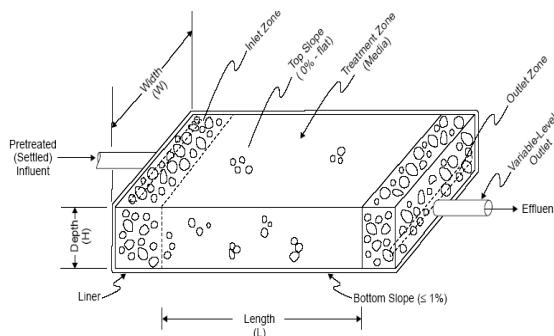


Figure2. Components of an artificial wetland system

As shown in figure (2), the main components of a wetland system are [figure (3)]:

- 1- Incoming pipe
- 2- Clay and combination membrane and membrane process over pond's length.
- 3- Weak materials for pond filling
- 4- Planted vegetation
- 5- Exhaust pipe and control system of water surface.

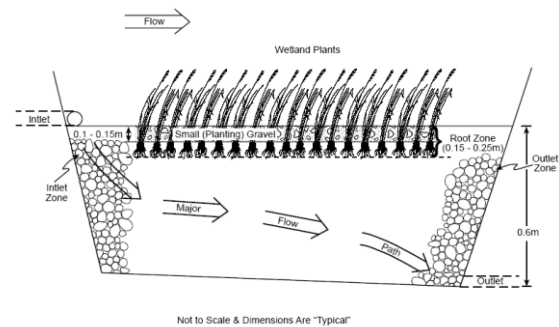


Figure3. Components of a wetland system

ADVANTAGES OF USING PLANTS

Plants that grow in a wetland help with treatment in several ways:

Oxygen Transfer

Plants transfer oxygen from leaf to root. This operation is done to grow roots and Phytotoxic decomposition (toxic substances around the roots). This operation helps aerobic bacteria around the roots to decompose organic substances of sewage.

Increase in Penetrability of Wetland Layers

The root penetration into the soil causes not only the water move around the root, but also destruction and rotting of old roots and provides some orifices for water transition.

Nitrogen and Phosphorus Pick Up

Nitrogen and phosphorus are picked up through the layers of wetlands (approximately 20 percent of nitrogen).

Evaporation and Transpiration

Evaporation and transpiration causes the reduction of sewage volume.

Insulation

One of the advantages of plants in the system is their role as insulation in cold seasons.

Plants in wetlands can be the operator of simplification in gas transition into and out of sewage. Studies show the role of oxygen import is more. However, plants cause the methane gas and other dissolved gases of sewage to exit.

The amount of oxygen transition through the roots of plant depends on many factors, such as dissolved oxygen density in sewage, depth of roots in sewage, air, and temperature of leaf. The rate of oxygen transition (CO_2) by plants is between 0 and 3 ($\text{g-O/m}^2\text{-d}$) which is very low to be able to provide all of the necessary oxygen for an under irrigation system.

Roots of plants in wetlands play an effective role in attracting phosphorus and nitrogen and metals and plants transmit their nutrients by roots and stem. Studies show that nitrogen absorption (N_2) by plants is between 12 and 20 ($\text{gN/m}^2\text{-y}$) and phosphorus absorption is equal to 1.8 to 18 ($\text{gP/m}^2\text{-y}$) but the rate of absorption depends on the type of plants. For example, the minimum and maximum values of these factors belong to straw plants and bulrush. The rate of phosphorus, nitrogen and metal deletion varies with time and most of the nutrient absorption by plants occurs in the growing season, that is mid spring and summer.

Disposal of sewage pollutants by wetland system:

Wetland treats sewage by physical, chemical and biological processes. The quality of sewage discharge depends on many parameters some of which are not measurable and only some parameters such as internal system parameters are helpful. For example, properties of wetlands are measurable.

In diagram (1) the rate of pollutant deletion in a designed wetland system in one of the villages in the United States is illustrated. The rate of pollutant disposal by the wetland system was well and the wastewater discharge for plants irrigation had enough quality. In table (1) the quality of sewage discharge in the surface wetland system is illustrated.

In the sub-surface wetland system, the most rates of TSS are disposed in the first few meters

of reactor. Also, examination shows that the rate of nitrogen in sewage is reduced by 60 to 86 percent in the wetland system.

Nitrification and denitrification are most important factors for sewage nitrogen reduction and these are done well in the reactor of the wetland. The rate of nitrogen in wastewater discharge with 6 to 7 days remaining time is less than 10 Mg in a liter [Diagram (2)].

The rate of phosphorus deletion is not well in wetland system and special materials should be used to reduce phosphorus better. Special materials mean those materials that contain iron or aluminum. Using of these materials is unaffordable and after a short time they lose their efficiency. Therefore, these materials are not recommended in wetlands.

Generally, some factors such as entrance sewage, hydraulics of entrance sewage, weather and physical factors of system are effective factors for rate of sewage discharge quality parameters.

CONCLUSION

Wetlands are an affordable and executable method for sewage treatment in different climatic zones. Their application can have a strong influence on general hygienic level at reduced cost. The following conclusions can be drawn for a wetland system:

- Low construction fee of treatment.
- Easy utilization of treatment system.
- Improving ground water quality for development of villages.
- Reduction of diseases caused by sewage.
- Increase of green spaces in villages by execution of wastewater transferring design and using for irrigation.

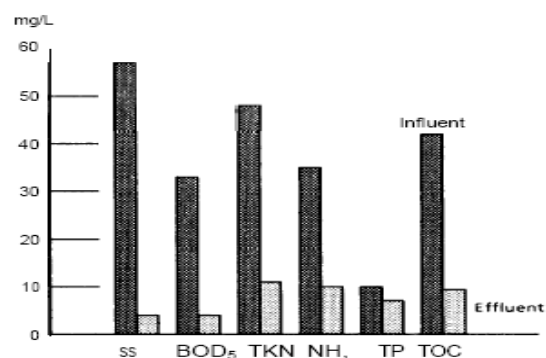


Figure 4. The rate of pollutant material deleting in wetlands system

Table1. Quality of discharging sewage in sub-surface wetlands system

Table 3-5. Background Concentrations of Contaminants of Concern in FWS Wetland Treatment System Effluents

Constituent	Range (mg/L)	Typical (mg/L)	Factors Governing Value	Reference
TSS	2-5	3	Plant types, coverage, Climate, wildlife	Reed et al., 1995; Kadlec and Knight, 1996
BOD ₅ ¹	2-8	5	Plant types, coverage, Climate, plant density	Reed et al., 1995 Gearheart, 1992
BOD ₅ ²	5-12	10	Plant types, coverage, Climate, plant density	Kadlec and Knight, 1996
TN	1-3	2	Plant types, coverage, Climate, oxic/anoxic	Kadlec and Knight, 1996 Reed et al., 1995
NH ₄ ⁺ -N	0.2-1.5	1.0	Plant types, coverage, Climate, oxic/anoxic	Kadlec and Knight, 1996 Reed et al., 1995
TP	0.1-0.5	0.3	Plant types, coverage, Climate, soil type	Kadlec and Knight, 1996 Reed et al., 1995
Fecal Coli CFU/100 ml	50-5,000	200	Plant types, coverage, Climate, wildlife	Watson et al, 1987; Gearheart et al., 1989

¹Wetland system with significant open water and submergent vegetation
²Wetland system fully covered by emergent vegetation

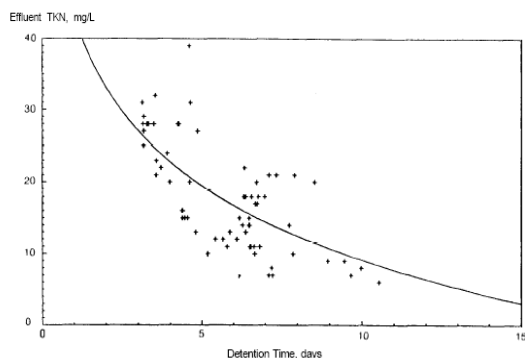


Figure5. The rate of nitrogen in discharging wastewater with remaining time

REFERENCES

[1] Ostad-Ali-Askari, K., Shayannejad, M. 2015, Study of sensitivity of Autumnal wheat to under irrigation in Shahrekord, Shahrekord City, Iran. *International Journal of Agriculture and Crop Sciences*, 8 (4), 602-605.

[2] Shayannejad, M., Akbari, N., Ostad-Ali-Askari, K. 2015, Study of modifications of the river physical specifications on muskingum coefficients, through employment of genetic algorithm. *International Journal of Development Research*, 5(3), 3782-3785.

[3] Ostad-Ali-Askari, K., Shayannejad, M. 2015, The Reviews of Einstein's Equation of Logarithmic Distribution Platform and the Process of Changes in the Speed Range of the Karkheh River, Khuzestan province, Iran. *International Journal of Development Research*, 5(3), 3786-3790.

[4] Ostad-Ali-Askari, K., Shayannejad, M., Ghorbanizadee-Kharazi, H. 2015, Assessment of artificial neural network performance and exponential regression in prediction of effective rainfall, *International Journal of Development Research*, 5(3),3791-3794.

[5] Shayannejad, M. Akbari, N. and Ostad-Ali-Askari, K. 2015, Determination of the nonlinear Muskingum model coefficients using genetic algorithm and numerical solution of the continuity.

Int. J. of Science: Basic and Applied Research, 21(1),1-14.

[6] Ostad-Ali-Askari, K., Shayannejad, M. 2015, The Study of Mixture Design for Foam Bitumen and the Polymeric and Oil Materials Function in Loose Soils Consolidation. *Journal of Civil Engineering Research*, 5(2), 39-44. DOI: 10.5923/j.jce.20150502.04

[7] Sayedipour, M., Ostad-Ali-Askari, K., Shayannejad, M. 2015, Recovery of Run off of the Sewage Refinery, a Factor for Balancing the Isfahan-Borkhar Plain Water Table in Drought Crisis Situation in Isfahan Province-Iran. *American Journal of Environmental Engineering*, 5(2): 43-46. DOI: 10.5923/j.ajee.20150502.02

[8] Ostad-Ali-Askari, K., Shayannejad, M. 2015, Developing an Optimal Design Model of Furrow Irrigation Based on the Minimum Cost and Maximum Irrigation Efficiency. *International Bulletin of Water Resources & Development*, 3(2), 18-23.

[9] Ostad-Ali-Askari K. Groundwater. Horoufchin publisher, First Edition, 2015. ISBN: 978-600-7419-33-5. Isfahan, Iran.

[10] Shayannejad M, Ostad-Ali-Askari K. Modeling of solute movement in groundwater. Kankash publisher. First edition, 2015. ISBN: 978-600-136-256-9. Isfahan, Iran.

[11] Shayannejad M, Ostad-Ali-Askari K. Optimization and its application in water resources management. Kankash publisher. First edition, 2015. ISBN: 978-600-136-248-4. Isfahan, Iran.

[12] Ostad-Ali-Askari K. Nitrate pollution in groundwater. Horoufchin publisher, First Edition, 2015. ISBN: 978-600-7419-23-6. Isfahan, Iran.

[13] Ostad-Ali-Askari, K., Shayannejad, M. 2015, Presenting a Mathematical Model for Estimating the Deep Percolation Due to Irrigation. *International Journal of Hydraulic Engineering*, 4(1), 17-21. DOI: 10.5923/j.ijhe.20150401.03.

[14] Ostad-Ali-Askari, K., Shayannejad, M. 2015, Usage of rockfill dams in the HEC-RAS software

- for the purpose of controlling floods. *American Journal of Fluid Dynamics*, 5(1), 23-29. DOI: 10.5923/j.ajfd.20150501.03.
- [15] Ostad-Ali- Askari, K., Shayannejad, M. 2015, The effect of heterogeneity due to inappropriate tillage on water advance and recession in furrow irrigation. *Journal of Agricultural Science*, 7(6), 127-136.
- [16] Shayannejad, M., Ostad-Ali-Askari, K. 2015, Effects of magnetized municipal effluent on some chemical properties of soil in furrow irrigation. *International Journal of Agriculture and Crop Sciences*, 8(3), 482-489.
- [17] Ostad-Ali-Askari K, Shayannejad M, Golabchian M. Numerical methods in groundwater. Kankash publisher. First edition, 2015. ISBN: 978-600-136-276-7. Isfahan, Iran.
- [18] Ostad-Ali-Askari, K., Shayannejad, M. 2015, Optimal design of pressurized irrigation laterals installed on sloping land. *International Journal of Agriculture and Crop Sciences*, ISSN 2227-670X. 8(5), 792-797.
- [19] Ostad-Ali-Askari K, Shayannejad M, Eslamian S, Jahangiri A.K, Shabani A.H, Environmental Hydraulics of Open Channel Flows. Kankash Publisher. First Edition, 2015. ISBN: 978-600-136-303-0.
- [20] Ostad-Ali-Askari K, Shayannejad M, Eslamian S, Navab-Pour B. 2016, Comparison of solution of Saint-Venant equations by characteristics and finite difference methods for unsteady flow analyzing in open channel. *International Journal of Hydrology Science and Technology*, 6(3), 9-18.
- [21] Ostad-Ali-Askari K, Shayannejad M, Eslamian S, et al. 2017, Deficit Irrigation: Optimization Models. *Management of Drought and Water Scarcity. Handbook of Drought and Water Scarcity*, Taylor & Francis Publisher, USA. Vol. 3. 1th Edition, pp: 373-389.
- [22] Shayannejad M, Ostad-Ali-Askari K, Eslamian S, et al. 2017, Development of a new method for determination of infiltration coefficients in furrow irrigation with natural non-uniformity of slope. *Sustain. Water Resour. Manag.*, 3(2): 163-169.
- [23] Shojaei N, Shafaei-Bejestan M, Eslamian S, Marani-Barzani M, P. Singh V, Kazemi M, Ostad-Ali-Askari K. 2017, Assessment of Drainage Slope on the Manning Coarseness Coefficient in Mountain Area. *International Journal of Constructive Research in Civil Engineering (IJCRCE)*, 3(1): 33-40.
- [24] Bahmanpour H, Awhadi S, Enjili J, Eslamian S, Ostad-Ali-Askari K. 2017, Optimizing Absorbent Bentonite and Evaluation of Contaminants Removal from Petrochemical Industries Wastewater. *International Journal of Constructive Research in Civil Engineering (IJCRCE)*, 3(2): 34-42.
- [25] Shayannejad M, Eslamian S, Gandomkar A, Marani-Barzani M, Amoushahi-Khouzani M, Majidifar Z, Rajaei-Rizi F, Kazemi M, P. Singh V, Dehghan SH, Shirvani-Dastgerdi H.R, Norouzi H, Ostad-Ali-Askari K. 2017, A Proper Way to Install Trapezoidal Flumes for Measurements in Furrow Irrigation Systems. *International Journal of Research Studies in Agricultural Sciences (IJRSAS)*, 3(7): 1-5.
- [26] Dehghan Sh, Kamaneh S.A.A., Eslamian S, Gandomkar A, Marani-Barzani M, Amoushahi-Khouzani M, Singh V.P., Ostad-Ali-Askari K. 2017, Changes in Temperature and Precipitation with the Analysis of Geomorphic Basin Chaos in Shiraz, Iran. *International Journal of Constructive Research in Civil Engineering (IJCRCE)*, 3(2): 50-57.
- [27] Eslamian S, Mirabbasi-Najafabadi R, Ostad-Ali-Askari K. *Advance Engineering Statistics (Simulation and Modeling of Uncertainty and Sensitivity Analysis)*. Kankash Publisher. First Edition, 2017. ISBN: 978-600-136-359-7. Isfahan, Iran.
- [28] Ostad-Ali-Askari K, Shayannejad M. 2016, Flood Routing in Rivers by Muskingum's Method With New Adjusted Coefficients. *International Water Technology Journal, IWTJ*, 6(3): 189-194.
- [29] Godarzi A, Eslamian S, Ostad-Ali-Askari K. *Water in Literature Aspects (Social and Cultural Aspects)*. Publication of Tehran Municipality. First Edition, 2016. ISBN: 978-600-439-096-5. Tehran, Iran.
- [30] Ostad-Ali-Askari K, Eslamian S, Shayannejad M, et al. *Groundwater Hydrodynamic*. Horoufchin Publisher. First Edition, 2016. ISBN: 978-600-7419-53-3. Isfahan, Iran.
- [31] Ostad-Ali-Askari K, Shayannejad M, Ghorbanizadeh-Kharazi H. 2017, Artificial Neural Network for Modeling Nitrate Pollution of Groundwater in Marginal Area of Zayandeh-rood River, Isfahan, Iran. *KSCE Journal of Civil Engineering*, 21(1):134-140. Korean Society of Civil Engineers. DOI 10.1007/s12205-016-0572-8.
- [32] Shayannejad M, Ostad-Ali-Askari K, Ramesh A, Singh V.P., Eslamian S. 2017, Wastewater and Magnetized Wastewater Effects on Soil Erosion in Furrow Irrigation. *International Journal of Research Studies in Agricultural Sciences*

- (IJRSAS), 3(8): 1-14. <http://dx.doi.org/10.20431/2454-6224.0308001>.
- [33] Shayannejad M, Soltani-Toudeshki A.R, Arab M.A, Eslamian S, Amoushahi-Khouzani M, Marani-Barzani M, Ostad-Ali-Askari K. 2017, A Simple Method for Land Grading Computations and its Comparison with Genetic Algorithm (GA) Method. *International Journal of Research Studies in Agricultural Sciences (IJRSAS)*, 3(8): 26-38.
- [34] Mohieyimen P, Eslamian S, Ostad-Ali-Askari K, Soltani M. 2017, Climate Variability: Integration of Renewable Energy into Present and Future Energy Systems in Designing Residential Buildings. *International journal of Rural Development, Environment and Health Research(IJREH)*, 1(2): 18-30.
- [35] Shayannejad M, Ostad-Ali-Askari K, Eslamian S, et al. 2017, Flow Hydraulic Investigation of the Wastewater on the Soil and Magnetic Field Effects in This Field. *International Journal of Constructive Research in Civil Engineering (IJCRCE)*, 3(3): 1-15.
- [36] Shayannejad M, Eslamian S, Singh V.P., Ostad-Ali-Askari K, et al. 2017, Evaluation of Groundwater Quality for Industrial Using GIS in Mountainous Region of Isfahan Province, Koh-Payeh, Isfahan, Iran. *International Journal of Constructive Research in Civil Engineering (IJCRCE)*, 3(3): 24-37.
- [37] Eslamian S, P. Singh V, Ostad-Ali-Askari K, R. Dalezios N, Yihdego Y, et al. 2017, Assessment of Aridity Using Geographical Information System in Zayandeh-Roud Basin, Isfahan, Iran. *International Journal of Mining Science (IJMS)*, 3(2): 49-61.
- [38] Askari Z, Samadi-Boroujeni H, Fattahi-Nafchi R, Yousefi N, Eslamian S, Ostad-Ali-Askari K, P. Singh V, R. Dalezios N. 2017, Prediction Comparison of Flow Resistance in Channels with Rounded and Angular Coarse Rough Beds. *American Research Journal of Civil and Structural*, 3(1): 1-15.
- [39] Ghane M, Alvankar S.R., Eslamian S, Amoushahi-Khouzani M, Gandomkar A, Zamani E, Marani-Barzani M, Kazemi M, Soltani M, Dehghan SH, P. Singh V, Ostad-Ali-Askari K, HaeriHamedani M, Shirvani-Dastgerdi H.R., Zalaki-Badil N. 2017, Sensitivity Analysis of Runoff Model by SWAT to Meteorological Parameters: A Case Study of Kasillian Watershed, Mazandaran, Iran. *International Journal of Research Studies in Agricultural Sciences (IJRSAS)*, 3(10): 1-20.
- [40] Shayannejad M, Abedi M.S., Eslamian S, Ostad-Ali Askari K, Gandomkar A, Cheng A, et al. 2017, The Contribution of Artificial Charging in Optimal Exploitation of Water Resources, Isfahan, Iran. *International Journal of Mining Science (IJMS)*, 3(3): 9-20.
- [41] Eslamian S, Ostad-Ali Askari K, et al. 2017, Guidelines to Optimal Design of Furrow Irrigation Based on Plants, Soil and Furrow Specifications. *International Journal of Constructive Research in Civil Engineering (IJCRCE)*, 3(4): 20-39.
- [42] Eslamian S, Gandomkar A, Khademolhoseiny A, Ostad-Ali Askari K, et al. 2017, The Study on the Geo-Morphism Related Characteristics of Shiraz Geomorphic Basin, Fars Province, Iran. *International Journal of Mining Science (IJMS)*, 3(4): 10-23. DOI: <http://dx.doi.org/10.20431/2454-9460.0304002>
- [43] Eslamian S, Ostad-Ali Askari K, P. Singh V, R. Dalezios N, Yihdego Y, Matouq M. 2017, A Review of Drought Indices. *International Journal of Constructive Research in Civil Engineering (IJCRCE)*, 3(4): 48-66. DOI: <http://dx.doi.org/10.20431/2454-8693.0304005>.
- [44] Ghasemi-Zaniani M, Eslamian S, Ostad-Ali Askari K, P. Singh V, R. 2017, Irrigation with Waste Water Treated by Constructed Wetlands. *International Journal of Research Studies in Agricultural Sciences (IJRSAS)*, 3(11): 18-34. DOI: <http://dx.doi.org/10.20431/2454-6224.0311002>.
- [45] Zalaki N, Zohoorian-Pordel M, Bornaa R, Neisi H, Eslamian S, Ostad-Ali-Askari K, P. Singh V, et al. 2017, Assessment of Anthropogenic Influences on the Micro-Climature of Wetland Ecosystems: The Case of Hoor-Alazim Wetland in Iran. *International Journal of Mining Science (IJMS)*, 3(4): 34-51. DOI: <http://dx.doi.org/10.20431/2454-9460.0304004>.
- [46] Hasheminasab S.A, Pirnazar M, Hasheminasab S.H, Zand Karimi A, Eslamian S, Ostad-Ali-Askari K, P. Singh V, R. Dalezios N. 2017, Fire Risk Potential Checking in Forests using Fire Risk Model. *International Journal of Constructive Research in Civil Engineering (IJCRCE)*, 3(4): 67-75. DOI: <http://dx.doi.org/10.20431/2454-8693.0304006>.
- [47] Abbasova, D., Eslamian, S., Nazari, R., 2017, Paleo-Drought: Measurements and Analysis, Ch. 34 in *Handbook of Drought and Water Scarcity, Vol. 2: Environmental Impacts and Analysis of Drought and Water Scarcity*, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 665-674.
- [48] Yihdego, Y., Eslamian, S., 2017, Drought Management: Initiatives and Objectives, Ch. 1 in *Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity*, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 1-26.
- [49] Tuncok, I. K., Eslamian, S., 2017, Drought Management Strategies in Water-Stressed/Water-Scarce Regions, Ch. 5 in *Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity*,

- Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 97-154.
- [50] Reinstädler, S., Islam, S. N., Eslamian, S., 2017, Drought Management for Landscape and Rural Security, Ch. 8 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 195-234.
- [51] Dalezios, N. R., Eslamian, S., 2017, Drought Assessment and Management for Heat Waves Monitoring, Ch. 9 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 235-260.
- [52] Kruse, E., Eslamian, S., 2017, Groundwater Management in Drought Conditions, Ch. 11 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 275-282.
- [53] Araghinejad, S., Hosseini-Moghari, S.-M., Eslamian, S., 2017, Reservoir Operation during Drought, Ch. 12 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 283-292.
- [54] Eslamian, S., Khosravi, B., Sayahi, M., Haeri-Hamedani, M. 2017, Crises Management Planning and Drought Management Plans, Ch. 13 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 293-304.
- [55] Halbac-Cotoara-Zamfir, R., Eslamian, S., 2017, Functional Analysis of Regional Drought Management, Ch. 14 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 305-328.
- [56] Zahraei, A., Saadati, S., Eslamian, S., 2017, Irrigation Deficit: Farmlands, Ch. 16 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 343-358.
- [57] Amiri, M. J., Eslamian, S., Bahrami, M., Yousefi, N. 2017, Deficit Irrigation: Greenhouse, Ch. 17 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 359-372.
- [58] Ostad-Ali-Askari, K., Shayanejad, M., Eslamian, S., Zamani, F., Shojaei, N., Navabpour, B., Majidifard, Z., Sadri, A., Ghasemi-Siani, Z., Nourozi, H., Vafaei, O., Homayouni. S.-M.-A., 2017, Deficit Irrigation: Optimization Models, Ch. 18 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 373-390.
- [59] Eludoyin, A. O., Eludoyin, O. M., Eslamian, S., 2017, Drought Mitigation Practices, Ch. 19 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 391-402
- [60] Irshad, S. M., Eslamian, S., 2017, Politics of Drought Management and Water Control in India, Ch. 22 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 447-460.
- [61] Pati, R., Eslamian, S., 2017, Drought Management for Horticultural Crops in India, Ch. 23 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 461-482.
- [62] Khan, S., Eslamian, S., 2017, Ch. 25 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 495-526.
- [63] Sedaei, L., Sedaei, N., Cox, J. P., Dalezios N. R., Eslamian, S., 2017, Forest Fire Mitigation under Water Shortage, Ch. 26 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 527-550.
- [64] Torabi Farsani, N., Neto de Carvalho, C., Eslamian, S., 2017, Education Program for Drought, Ch. 27 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 551-566.
- [65] Nazif, S. and Tavakolifar, H., Eslamian, S., 2017, Emergency Drought Consequence Plan, Ch. 30 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 640-658
- [66] Mohseni Saravi, M., Shabazi, R., Eslamian, S., 2017, Coping with Drought- Ch. 31 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 659-673

- [67] Eslamian, S., Mohri-Isfahani, E., Mahdavi, A., Rajaei-Rizi, F., Marzi-Nouhedani, M., Ghasemi-Zanyani, M., Dehghani, S., Hosseini-Teshnizi, S. Z., Esmaili, F., Shojaei, N., Ghane, M., Hasantabar-Amiri, A., 2017, Integrated Water Resources Management Under Water Scarcity, Ch. 32 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 675-695.
- [68] Aghaei, A., Eslamian, S., Dalezios, N. R., Saeidi-Rizi, A., Bahrebardar, S., 2017, Drought and Dust Management, Ch. 33 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 696-705.
- [69] Eslamian, S., Dalezios, N. R., Singh, V. P., Adamowaski, J., Mohamadifard, S., Bahmani, R., Eskandari, S., Zomorodian, M., Arefeyan, A., Dehghani, S., Aghaesmaeili, M., Shahbazi, M., Amoushahi, M. T., Yousefi, N., Namdi, A., 2017, Drought Management: Current Challenges and Future Outlook, Ch. 34 in Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA.
- [70] Eslamian, S., Davari, A., and Reyhani, M. N., 2017, Iranian Qanāts : An Ancient and Sustainable Water Resources Utilization, Ch. 9, in Underground Aqueducts Handbook, Ed. By Angelakis A. N. et al., Taylor and Francis, CRC Group, 123-150.
- [71] Khan, S., and Eslamian, S., 2017, Managing Drought through Qanāt and Water Conservation in Afghanistan, Ch. 22, in Underground Aqueducts Handbook, Ed. By Angelakis A. N. et al., Taylor and Francis, CRC Group, 385-402.
- [72] Wessels, J. I., Vardakos, S., Weingartner, H., Eslamian, S., Angelakis, A. N., 2017, Underground Aqueducts: Past, Present, and Future Trends, Ch. 29 in Underground Aqueducts Handbook, Ed. By Angelakis A. N. et al., Taylor and Francis, CRC Group, 491-510.
- [73] Dalezios, N.R., Tarquis, A. M. and Eslamian, S. 2017: Droughts. Chapter 5, in book: Environmental Hazards Methodologies for Risk Assessment and Management. Editor: Dalezios, N. R., International Water Association Publishing, London, UK, 177-210.
- [74] Dalezios, N. R. and Eslamian, S, 2017, Environmental Hazards Methodologies for Risk Assessment and Management, Ed. By Dalezios, N. R., IWA Publishing,
- [75] Bazrkar, M. H., Adamowski, J., Eslamian, S., 2017, Water System Modeling, in Mathematical Advances Towards Sustainable Environmental Systems, Ed. by Furze, J.N., Swing, K., Gupta, A.K., McClatchey, R., Reynolds, D., Springer International Publishing, Switzerland, 61-88.
- [76] Zareeian, M.J., Eslamian, S., Gohari, A., and Adamowski, J. 2017. The Effect of Climate Change on Watershed Water Balance, in Mathematical Advances Towards Sustainable Environmental Systems, Ed. by Furze, J.N., Swing, K., Gupta, A.K., McClatchey, R., Reynolds, D., Springer International Publishing, Switzerland, 215-238.
- [77] Bazrkar, M. H., Zamani, N., Eslamian, S., Eslamian, A., Dehghan, Z., 2015, Urbanization and Climate Change, Handbook of Climate Change Adaptation, Ed. By Leal Filho, W., Springer, 619-655.
- [78] Gohari, A., Zareeian, M. J. and Eslamian, S., 2015, A multi-model framework for climate change impact assessment, Handbook of Climate Change Adaptation, Ed. By Leal Filho, W., Springer, 17-35.
- [79] Chen, Z., Ngo, H. H., Guo, W, and Eslamian, S., 2015, Water Shortages, in Urban Water Reuse Handbook, Ch. 1, Ed. By Eslamian, S., Taylor and Francis, CRC Group, USA, 3-14.
- [80] Boogaard, F. and Eslamian, S., 2015, Water Reuse and Sustainable Urban Drainage Systems, in Urban Water Reuse Handbook, Ch. 4, Ed. By Eslamian, S., Taylor and Francis, CRC Group, USA, 37-44.
- [81] Shah Naqvi, S. A. A., Sultan, A., and Eslamian, S., 2015, Water Quality Issues in Urban Water, in Urban Water Reuse Handbook, Ch. 8, Ed. By Eslamian, S., Taylor and Francis, CRC Group, USA, 99-112.
- [82] Kumar Singh, Ch., Jha, N., and Eslamian, S., 2015, Reuse, Potable Water, and Possibilities, in Urban Water Reuse Handbook, Ch. 9, Ed. By Eslamian, S., Taylor and Francis, CRC Group, USA, 113-126.
- [83] Kohansal, M. M., Saadati, S., Tarkesh Esfahany, S., and Eslamian, S., 2015, Urban Water Reuse in Industry, in Urban Water Reuse Handbook, Ch. 11, Ed. By Eslamian, S., Taylor and Francis, CRC Group, USA, 137-148.
- [84] Kumar, M., Chidambaram, S., Ramanathan, A. L., Goswami, R., and Eslamian, S., 2015, Criterion, Indices, and Classification of Water Quality and Water Reuse Options, Urban Water Reuse Handbook, Ch. 13, Ed. By Eslamian, S., Taylor and Francis, CRC Group, USA, 163-176.
- [85] Eslamian, F., Eslamian, S., and Eslamian, A., 2015, Water Reuse Guidelines for Agriculture, Urban Water Reuse Handbook, Ch. 14, Ed. By Eslamian, S., Taylor and Francis, CRC Group, USA, 177-186.
- [86] Eslamian, A., Eslamian, F., and Eslamian, S., 2015, Water Reuse Guidelines for Industry, Urban Water Reuse Handbook, Ch. 15, Ed. By

- Eslamian, S., Taylor and Francis, CRC Group, USA, 187-194.
- [87] Eslamian, S., Eslamian, F., and Eslamian, A., 2015, Water Reuse Guidelines for Recreation, Urban Water Reuse Handbook, Ch. 16, Ed. By Eslamian, S., Taylor and Francis, CRC Group, USA, 195-200.
- [88] Banjoko, B. and Eslamian, S., 2015, Environmental Impact Assessment: An Application to Urban Water Reuse, Urban Water Reuse Handbook, Ch. 20, Ed. By Eslamian, S., Taylor and Francis, CRC Group, USA, 229-242.
- [89] Amiri, M. J., Eslamian, S., Arshadi, M., and Khozaei, M., 2015, Water Recycling and Community, Urban Water Reuse Handbook, Ch. 22, Ed. By Eslamian, S., Taylor and Francis, CRC Group, USA, 261-274.
- [90] Ferdaush, J., Noor Islam, Sh., Reinstädttler, S., and Eslamian, S., 2015, Ethical and Cultural Dimension of Water Reuse, Urban Water Reuse Handbook, Ch. 24, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 285-296.
- [91] Bazrkar, M. H., Zamani, N., and Eslamian, S., 2015, Evaluation of Socioeconomic Impacts of Urban Water Reuse Using System Dynamics Approach, Urban Water Reuse Handbook, Ch. 28, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 331-340.
- [92] Mujere, N. and Eslamian, S., 2015, Blackwater System, Urban Water Reuse Handbook, Ch. 33, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 393-404.
- [93] Abu-Ghunmi, L., and Eslamian, S., 2015, Graywater, Urban Water Reuse Handbook, Ch. 34, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 405-420.
- [94] Eslamian, S., Amininezhad, S. M., and Amininejad, S. M., 2015, Contamination Warning System, Urban Water Reuse Handbook, Ch. 39, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 481-488.
- [95] Crusberg, T. C., and Eslamian, S., 2015, Choosing Indicators of Fecal Pollution for Wastewater Reuse Opportunities, Urban Water Reuse Handbook, Ch. 42, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 511-520.
- [96] Boogaard, F. and Eslamian, S., 2015, Wastewater Monitoring, Urban Water Reuse Handbook, Ch. 48, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 583-586.
- [97] Mujere, N., and Eslamian, S., 2015, Urban Wetland Hydrology and Water Purification, Urban Water Reuse Handbook, Ch. 50, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 603-616.
- [98] Nazif, S., and Eslamian, S., 2015, Urban Wetland Hydrology and Changes, Urban Water Reuse Handbook, Ch. 51, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 617-640.
- [99] Banjoko, B., and Eslamian, S., 2015, Phytoremediation, Urban Water Reuse Handbook, Ch. 53, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 657-702.
- [100] Rivas Hernández, A., Rivas Acosta, I., and Eslamian, S., 2015, Treatment Wetlands: Fundamentals, Urban Water Reuse Handbook, Ch. 54, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 703-716.
- [101] Rahman, A., and Eslamian, S., 2015, Rainwater Tanks as a Means of Water Reuse and Conservation in Urban Areas, Urban Water Reuse Handbook, Ch. 60, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 797-808.
- [102] Qian, Q., and Eslamian, S., 2015, Groundwater Recharge and Unconventional Water: Design and Management Criteria, Urban Water Reuse Handbook, Ch. 61, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 809-816.
- [103] Saket, R. K. and Eslamian, S., 2015, Use of Wastewater for Hydroelectric Power Generation, Urban Water Reuse Handbook, Ch. 63, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 827-838.
- [104] Eslamian, S., Amininezhad, S. M., Amininejad, S. M., Adamowski, J., 2015, Application of Nanotechnology in Water Reuse, Urban Water Reuse Handbook, Ch. 64, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 839-844.
- [105] Goodarzi, E., Ziaei, L. and Eslamian, S., 2015, Recycled Water in Basin and Farm Scales, Urban Water Reuse Handbook, Ch. 65, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 855-858.
- [106] Perez Sierra, J. A. and Eslamian, S., 2015, Water Reuse in Coastal Areas, Urban Water Reuse Handbook, Ch. 67, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 867-874.
- [107] Noor Islam, Sh., Reinstädttler, S., and Eslamian, S., 2015, Water Reuse Sustainability in Cold Climate Regions, Urban Water Reuse Handbook, Ch. 68, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 875-886.
- [108] Rina, K., Eslamian, S., Tyagi, G., and Singh, N., 2015, Feasibility Studies for Water Reuse Systems, Urban Water Reuse Handbook, Ch. 71, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 909, 926.
- [109] Salequzzaman, MD., Tariqul Islam, S. M., Shiddi quzzaman, M., and Eslamian, S., 2015. Climate Change Adaptation and Water Reuse, Urban Water Reuse Handbook, Ch. 75, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 969-980.
- [110] Kumar Goyal, M., Singh, V., and Eslamian, S., 2015, Impact of Climate Change on Drinking Water, Urban Water Reuse Handbook, Ch. 76,

- Ed. By Eslamian, S., Taylor and Francis, CRC Group, 981-1006.
- [111]Hamdy, A. and Eslamian, S., 2015, Sustainable Reuse and Recycling of Treated Urban Wastewater, Urban Water Reuse Handbook, Ch. 80, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 1039-1054.
- [112]Thakur, J. K., Karmacharya, S., Singh, P., Gurung, D., and Eslamian, S., 2015, Water Reuse Products in Urban Areas, Urban Water Reuse Handbook, Ch. 81, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 1055-1070.
- [113]Eslamian, S., Sayahi, M., and Khosravi, B., 2015, Conjunctive Use of Water Reuse and Urban Water, Urban Water Reuse Handbook, Ch. 82, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 1071-1078.
- [114]Irfan, Z. B., and Eslamian, S., 2015, Urban Water Reuse Policy, Urban Water Reuse Handbook, Ch. 83, Ed. By Eslamian, S., Taylor and Francis, CRC Group, 1079-1096.
- [115]Vafakhah, M., Eslamian, S. and Khosrobeigi Bozchaloei, S., 2014, Low-Flow Hydrology, in Handbook of Engineering Hydrology, Ch. 20, Vol. 1: Fundamentals and Applications, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 433-453.
- [116]Cox, J. P., Shaeri Karimi, S. and Eslamian, S., 2014, Optimum Hydrometric Site Selection, in Handbook of Engineering Hydrology, Ch. 22, Vol. 1: Fundamentals and Applications, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 471-483.
- [117]Eslamian, S. and Motevallian, S. S., 2014, Sustainability in Urban Water System, in Handbook of Engineering Hydrology, Ch. 27, Vol. 1: Fundamentals and Applications, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 549-562.
- [118]Noor Islam, S., Karim, R., Noor Islam, A., and Eslamian, S., 2014, Wetland Hydrology, in Handbook of Engineering Hydrology, Ch. 29, Vol. 1: Fundamentals and Applications, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 581-605.
- [119]Gargouri-Ellouze, E. and Eslamian, S. 2014, Application of Copulas in Hydrology: Geomorphological Instantaneous Unit Hydrograph and Intensity Index of Infiltration Frequency, in Handbook of Engineering Hydrology, Ch. 1, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 1-18.
- [120]Mujere, N. and Eslamian, S. 2014, Climate Change Impacts on Hydrology and Water Resources, in Handbook of Engineering Hydrology, Ch. 7, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 113-126.
- [121]Farzaneh, M. R., Eslamian, S. and Mirnezami, S. J. E. 2014, Climate Change: Uncertainty, Impact, and Adaptation, in Handbook of Engineering Hydrology, Ch. 8, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 127-146.
- [122]Goodarzi, E. and Eslamian, S. 2014, Dam Risk and Uncertainty, in Handbook of Engineering Hydrology, Ch. 9, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 147-171.
- [123]Fakhri, M., Dokohaki, H., Eslamian, S., Fazeli Farsani, I. and Farzaneh, M. R. 2014, Flow and Sediment Transport Modeling in Rivers, in Handbook of Engineering Hydrology, Ch. 13, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 233-275.
- [124]Matouq, M., Al-Bilbisi, H., El-Hasan, T. and Eslamian, S. 2014, GIS Applications in a Changing Climate, in Handbook of Engineering Hydrology, Ch. 15, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 297-312.
- [125]Noor Islam, S., Gnauck, A., Voigt, H.-J. and Eslamian, S., 2014, Hydrological Changes in Mangrove Ecosystems, in Handbook of Engineering Hydrology, Ch. 18, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 353-373.
- [126]Kałuza, T. and Eslamian, S. 2014, Impact of the Development of Vegetation on Flow Conditions and Flood Hazards, in Handbook of Engineering Hydrology, Ch. 21, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 415-449.
- [127]Rahman, A., Haddad, Kh. and Eslamian, S., 2014, Regional Flood Frequency Analysis, 2014, in Handbook of Engineering Hydrology, Ch. 22, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 451-469.
- [128]Vafakhah, M. and Eslamian, S. 2014, Regionalization of Hydrological Variables, in Handbook of Engineering Hydrology, Ch. 23, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 471-499.
- [129]Chowdhury, R. K. and Eslamian, S. 2014, Statistical Parameters Used for Assessing Hydrological Regime, in Handbook of Engineering Hydrology, Ch. 26, Vol. 2: Modeling, Climate Changes and Variability,

- Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 537-551.
- [131]Mujere, N. and Eslamian, S. 2014, Impact of Urbanization on Runoff Regime, Chowdhury, R. K. and Eslamian, S. 2014, Statistical Parameters Used for Assessing Hydrological Regime, in Handbook of Engineering Hydrology, Ch. 29, Vol. 2: Modeling, Climate Changes and Variability, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 605-615.
- [132]Gaaloul, N. and Eslamian, S., 2014, Artificial Recharge Experiences in Semiarid Areas, in Handbook of Engineering Hydrology, Ch. 2, Vol. 3: Environmental Hydrology and Water Management, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 17-49.
- [133]Amininezhad, S. M., Amininejad, S. M., and Eslamian, S., 2014, Disinfection of Water and Nanotechnology, in Handbook of Engineering Hydrology, Ch. 3, Vol. 3: Environmental Hydrology and Water Management, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 51-64.
- [134]Shaeri Karimi, S., Yasi, M., Cox, J. P., and Eslamian, S., 2014, Environmental Flows, in Handbook of Engineering Hydrology, Ch. 5, Vol. 3: Environmental Hydrology and Water Management, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 85-104.
- [135]Eslamian, S., Malekian, R., and Amiri, M. J. 2014, Environmental Nanotechnology, in Handbook of Engineering Hydrology, Ch. 6, Vol. 3: Environmental Hydrology and Water Management, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 105-118.
- [136]Deiminiat, A., and Eslamian, S., 2014, River Managed System for Flood Defense, in Handbook of Engineering Hydrology, Ch. 14, Vol. 3: Environmental Hydrology and Water Management, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 299-314.
- [137]Deiminiat, A., Hassan Shojaee Siuki, and Eslamian, S. 2014, Tourism and River Environment, in Handbook of Engineering Hydrology, Ch. 20, Vol. 3: Environmental Hydrology and Water Management, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 401-419.
- [138]Green, C. and Eslamian, S., 2014, Water Governance, in Handbook of Engineering Hydrology, Ch. 24, Vol. 3: Environmental Hydrology and Water Management, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 461-483.
- [139]Eslamian, F. and Eslamian S., 2014, Water Pollution Control Using Low-Cost Natural Wastes, in Handbook of Engineering Hydrology, Ch. 25, Vol. 3: Environmental Hydrology and Water Management, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 485-499.
- [140]He, Ch., Zhang, L., Zhang, X., and Eslamian, S., 2014, Water Security: Concept, Measurement, and Operationalization, in Handbook of Engineering Hydrology, Ch. 28, Vol. 3: Environmental Hydrology and Water Management, Ed. By Eslamian, S., Francis and Taylor, CRC Group, USA, 545-554.
- [141]Fakhri, M., Farzaneh, M. R., Eslamian S. and Nazari, R., 2013, Wind speed regionalization under climate change conditions, Chapter 10, New Developments in Renewable Energy by H. Arman & I. Yukcel, 215-236.
- [142]Nazari, R., Khanbilvardi, R., Hoyos, S., and Eslamian, S., 2013, Freshwater Demands and Storages, Encyclopedia of Crises Management, Sage Publication.
- [143]Eslamian, S., 2012, Forecasting, Encyclopedia of Energy, Salem Press, USA, 461-464
- [144]Eslamian, S., 2012, Iran, Encyclopedia of Energy, Salem Press, USA, 708-713.
- [145]Eslamian, S. and Nazari, R., 2012, Nebraska, Encyclopedia of Energy, Salem Press, USA, 889-893.
- [146]Nazari, R., S. Eslamian and R. Khanbilvardi, 2012, Water Reuse and Sustainability, Chapter 11, in Ecological Water Quality-Water Treatment and Reuse by K. Voudouris and D. Vousta, 241-254, Intech.
- [147]Eslamian, S. S., Gilroy K. L. and R. H. McCuen, 2011, Climate Change Detection and Modeling in Hydrology, Ch. 5 in "Climate Change –Research and Technology for Adaptation and Mitigation" Edited by J. Blanco and H. Kheradmand, InTech, 87-100.
- [148]Zahraei, A., Eslamian, S. and Saadati, S., 2016. The effect of water extraction time from the river on the performance of off-stream reservoirs. International Journal of Hydrology Science and Technology, 6(3): 254-265.
- [149]Zareian, M. J. and Eslamian, S., 2016, Variation of water resources indices in a changing climate, International Journal of Hydrology Science and Technology, Vol. 6, No. 2, 173 – 187.
- [150]Fathian, F., Dehghan, Z., Eslamian, S., Adamowski, J., 2016, Assessing Irrigation Network Performance Based on Different Climate Change and Water Supply Scenarios: A Case Study in Northern Iran, International Journal of Water, Accepted.
- [151]Fathian, F., Dehghan, Z., Eslamian, S., 2016, Evaluating the impact of changes in land cover and climate variability on streamflow trends (case study: eastern subbasins of Lake Urmia, Iran), J. Hydrology Science and Technology, Vol. 6, No. 1, 1-26.

- [152] Dalezios, N. R. and Eslamian, S., 2016, Regional design storm of Greece within the flood risk management framework, *Int. J. Hydrology Science and Technology*, Vol. 6, No. 1, 82–102.
- [153] Kamali, M. I., Nazari, R., Fridhosseini, A., Ansari, H., Eslamian, S., 2015, The Determination of Reference Evapotranspiration for Spatial Distribution Mapping Using Geostatistics, *Water Resources Management*, Vol. 29: 3929–3940.
- [154] Talchabhadel, R., Shakya, N. M. Dahal, V., and Eslamian, S., 2015, Rainfall Runoff Modelling for Flood Forecasting (A Case Study on West Rapti Watershed), *Journal of Flood Engineering*, Vol. 6, No. 1, 53-61.
- [155] Yousefi, N., Safaee, A., Eslamian, S., 2015, The Optimum Design of Flood Control System Using Multivariate Decision Making Methods (Case Study: Kan River Catchment Basin, Iran), *Journal of Flood Engineering*, Vol. 6, No. 1, 63-82.
- [156] Banihabib, M. E., Zahraei, A. and Eslamian, S., 2015, An integrated optimization model of reservoir and irrigation system applying uniform deficit irrigation, *Int. J. Hydrology Science and Technology*, Vol. 5, No. 4, 372–385.
- [157] Fathian, F., Prasad, A. D., Dehghan, Z., Eslamian, S., 2015, Influence of land use/land cover change on land surface temperature using RS and GIS techniques, *Int. J. Hydrology Science and Technology*, Vol. 5, No. 3, 195–207.
- [158] Abedi-koupai, J., Mollaei, R., Eslamian, S. S., 2015, The effect of pumice on reduction of cadmium uptake by spinach irrigated with wastewater, *Ecohydrology and Hydrobiology*, Vol. 15, No. 4, 208-214.
- [159] Kamali, M. I., Nazari, R., Faridhosseini, A., Ansari, H., Eslamian, S., 2015, The Determination of Reference Evapotranspiration for Spatial Distribution Mapping Using Geostatistics, *Water Resources Management*, 29:3929-3940.
- [160] Valipour, M., Gholami Sefidkouhi, M. A., Eslamian, S., 2015, Surface irrigation simulation models: a review, *Int. J. Hydrology Science and Technology*, Vol. 5, No. 1, 51-70.
- [161] Esmailzadeh, M., Heidarpour, M., Eslamian, S., 2015, Flow characteristics of sharp-crested side sluice gate, *ASCE's Journal of Irrigation and Drainage Engineering*, Vol. 141, No. 7, 10.1061/(ASCE)IR.1943-4774.0000852.
- [162] Zareian, M. J., Eslamian, S. and Safavi, H. R., 2015, A modified regionalization weighting approach for climate change impact assessment at watershed scale, *Theor. Appl. Climatol.*, 122:497-516.
- [163] Boucefiane A., Meddi M., Laborde J. P., Eslamian S. S., 2014, Rainfall Frequency Analysis Using Extreme Values, Distributions in the Steppe Region of Western Algeria, *Int. J. Hydrology Science and Technology*, Vol. 4, No. 4, 348-367.
- [164] Valipour, M., Eslamian, S., 2014, Analysis of potential evapotranspiration using 11 modified temperature-based models, *Int. J. Hydrology Science and Technology*, Vol. 4, No. 3, 192-207.
- [165] Meddi, M., Toumi, S., Assani, A. A., Eslamian, S., 2014, Regionalization of Rainfall Erosivity in Northern Algeria, *Int. J. Hydrology Science and Technology*, Vol. 4, No. 2, 155-175.
- [166] Zohrabi, N., Massah Bavani, A., Goodarzi, E., S. Eslamian, 2014, Attribution of temperature and precipitation changes to greenhouse gases in northwest Iran, *Quaternary International*, Vol. 345, 130-137.
- [167] Farshad F., Dehghan, Z., Eslamian, S., H. Bazrkar, 2015, Trends in hydrologic and climatic variables affected by four variations of Mann-Kendall approach in Urmia Lake basin, Iran, *Hydrological Sciences Journal*, DOI:10.1080/02626667.2014.932911.
- [168] Fazlolahi, H. and S. S. Eslamian, 2014, Using wetland plants in nutrient removal from municipal wastewater, *Int. J. Hydrology Science and Technology*, Vol. 4, No. 1, 68–80.
- [169] Farshad F., Dehghan, Z. and S. Eslamian, 2014, Analysis of Water Level Changes in Lake Urmia Based on Data Characteristics and Nonparametric Test, *Int. J. Hydrology Science and Technology*, Vol. 4, No. 1, 18–38.
- [170] Galoie, M., Eslamian, S., and A. Motamedi, 2014, An Investigation of the Influence of a Retention Dam on Flood Control in a Small Catchment Area in Austria, *Journal of Flood Engineering*, Vol. 5, No. 1/2, 1–15.
- [171] Deiminiat, A. and S. Eslamian, 2014, A Telemetry and Tele Control System for Local Flood Warning, A Case Study, *Journal of Flood Engineering*, Vol. 5, No. 1/2, 87–100.
- [172] Biabanaki, M., Eslamian, S., Abedi Koupai, J., Cañón, J., Boni, G. and M. Gheysari, 2014, A principal components/singular spectrum analysis approach to ENSO and PDO influences on rainfall in western Iran, *Journal of Hydrology Research*, Vol. 45, No. 2, 250-262.
- [173] Matouq, M., El-Hasan, T., Al-Bilbisi, H., Abdelhadi, M., Hindiyeh, M., Eslamian, S. and S. Duheisat, 2013, The climate change implication on Jordan: A case study using GIS and Artificial Neural Networks for weather forecasting, *Journal of Taibah University for Science*, Vol. 7, No. 2, 44-55.

- [174]Fazlolahi, H. and S. S. Eslamian, 2013, Nitrogen and Phosphorus removal from municipal wastewater by three wetland plant species, *Journal of River Engineering*, Vol. 1, No. 2., 14–20.
- [175]Bahmani, R., Radmanesh, F., Eslamian, S., Khorsandi, M., Zamani, R., 2013, Proper Rainfall for Peak Flow Estimation by Integration of L-Moment Method and a Hydrological Model, *International Research Journal of Applied and Basic Sciences*, Vol. 4, No. 10, 2959-2967.
- [176]Fakhry, M., Farzaneh, M. R., Eslamian, S. S. and M. J. Khordadi, 2013, Confidence interval assessment to estimate dry and wet spells under climate change in Shahrekord Station, Iran, *ASCE, Journal of Hydrologic Engineering*, Vol. 18, No. 7, 911-918.
- [177]Abdolvandi, A. F., Eslamian, S. S., Heidarpour, M., Babazadeh, H., Parsamehr, A., 2013, Simultaneous Simulation of both Surface and Groundwater Resources Using System Dynamics Approach (Case Study: Taleghan Dam), *Advances in Environmental Biology*, Vol. 7, No. 4, 562-570.
- [178]Bazrkar, M.H., Tavakoli-Nabavi, E., Zamani, N. and Eslamian, S., 2013, System dynamic approach to hydro-politics in Hirmand transboundary river basin from sustainability perspective, *Int. J. Hydrology Science and Technology*, Vol. 3, No. 4, 378–398.
- [179]Hadizadeh, R., Eslamian, S. and Chinipardaz, R., 2013, Investigation of long-memory properties in streamflow time series in Gamasiab River, Iran', *Int. J. Hydrology Science and Technology*, Vol. 3, No. 4, 319–350.
- [180]Zamani Nuri, A., Farzaneh, M. R., Fakhri, M., Dokoohaki, H., Eslamian, S. and Khordadi, M. J., 2013, Assessment of future climate classification on Urmia Lake basin under effect of climate change, *Int. J. Hydrology Science and Technology*, Vol. 3, No. 2, 128-140.
- [181]Varshney, L., Saket, R. K. and Eslamian, S., 2013, Power estimation and reliability evaluation of municipal waste water and self-excited induction generator-based micro hydropower generation system, *Int. J. Hydrology Science and Technology*, Vol. 3, No. 2, 176-191.
- [182]Amiri, M. J., Abedi-Koupai, J., Eslamian, S., Mousavi, S. F. and Arshadi, M., 2013, Modelling Pb(II) adsorption based on synthetic and industrial wastewaters by ostrich bone char using artificial neural network and multivariate non-linear regression, *Int. J. Hydrology Science and Technology*, Vol. 3, No. 3, 221-240.
- [183]Eslamian, S., Tarkesh Esfahany, S., Nasri, M. and Safamehr, M., 2013, Evaluating the potential of urban reclaimed water in area of north Isfahan, Iran, for industrial reuses, *Int. J. Hydrology Science and Technology*, Vol. 3, No. 3, 257-269.
- [184]Ajigoh, E. and Eslamian, S., 2013, Nyando catchment GIS modeling of flood in undated areas, *Journal of Flood Engineering*, Vol. 4, No. (1-2), 77–86.
- [185]Galoie, M., Zenz, G. and Eslamian, S., 2013, Determining the high flood risk regions using a rainfall-runoff modeling in a small basin in catchment area in Austria, *Journal of Flood Engineering*, Vol. 4, No. (1-2), 9–27.
- [186]Bazrkar, M. H., Fathian, F., and Eslamian, S., 2013, Runoff modeling in order to investigate the most effective factors in flood events using system dynamic approach (Case study: Tehran Watershed, Iran), *Journal of Flood Engineering*, Vol. 4, No. 1-2, 39–59.
- [187]Galoie, M., Zenz, G. and Eslamian, S., 2013, Application of L-moments for IDF determination in an Austrian basin, *Int. J. Hydrology Science and Technology*, Vol. 3, No. 1, 30-48.
- [188]Rostamian, R., Eslamian, S. and Farzaneh, M. R., 2013, Application of standardised precipitation index for predicting meteorological drought intensity in Beheshtabad watershed, central Iran, *Int. J. Hydrology Science and Technology*, Vol. 3, No. 1, 63-77.
- [189]Bahmani, R., Radmanesh, F., Eslamian, S., Khorsandi, M. and Zamani, R., 2013, Proper Rainfall for Peak Flow Estimation by Integration of L-Moment Method and a hydrologic model, *International Research Journal of Applied and Basic Sciences*, Vol. 4 No. 10, 2959-2967.
- [190]Mirabbasi, R., Anagnostou, E. N., Fakheri-Fard, A. Dinpashoh, Y. and Eslamian, S., 2013, Analysis of meteorological drought in northwest Iran using the Joint Deficit Index, *Journal of Hydrology*, Vol. 492, 35–48.
- [191]Gohari, A., Eslamian, S., Mirchi, A., Abedi-Koupaei, J., Massah-Bavani, A., Madani, K., 2013, Water transfer as a solution to water shortage: A fix that can blackfire, *Journal of Hydrology*, Vol. 491, 23–39.
- [192]Haghiabi, A. H., Mohammadzadeh-Habili, J., Eslamian, S. S., and S. F. Mousavi, 2013, Derivation of Ewsvorior's Area-Capacity Equations Based on the Shape Factor, *Iranian Journal of Science and Technology*, Vol. 37, No. C1, 163-167.
- [193]Gohari, A., Eslamian, S., Abedi-Koupaei, J., Massah-Bavani, A., Wang, D., Madani, K., 2013, Climate change impacts on crop production in Iran's Zayandeh-Rud River Basin. *Science of The Total Environment*, Vol. 442, 405-419.

- [194]Saatsaz, M., Azmin Sulaiman, W. N., Eslamian, S., Javadi, S., 2013, Development of a coupled flow and solute transport modelling for Astaneh-Kouchesfahan groundwater resources, North of Iran, *International Journal of Water*, Vol. 7, No.1/2, 80 – 103.
- [195]Saatsaz, M., Azmin-Sulaiman, W. N., Eslamian, S., Mohammadi, K., 2013, Hydrogeochemistry and groundwater quality assessment of Astaneh-Kouchesfahan Plain, Northern Iran, *International Journal of Water*, Vol. 7, No. 1/2, 44 – 65.
- [196]Eslamian, S., Amiri, M. J., Abedi-Koupai, J. and S. Shaeri-Karimi, 2013, Reclamation of unconventional water using nano zero-valent iron particles: an application for groundwater, *International Journal of Water*, Vol. 7, No. 1/2, 1-13.
- [197]Amiri, M.J., Abedi-koupai, J., Eslamian, S. S., Mousavi, S. F., Hasheminejad, H., 2013, Modeling Pb (II) adsorption from aqueous solution by ostrich bone ash using adaptive neural-based fuzzy inference system, *J Environ. Sci. Health A Tox. Hazard Subst. Environ. Eng.*, Vol. 48, No. 5: 543-58.
- [198]Biabanaki, M., Tabatabaei Naeini, A. and S. S. Eslamian, 2012, Effects of Urbanization on Stream Channels, *Journal of Civil Engineering and Urbanism (JCEU)*, Vo. 2, No. 4, 136-142.
- [199]Abdolhosseini, M., Eslamian, S., Mousavi, S. F., 2012, Effect of climate change on potential evapotranspiration: a case study on Gharehsoo sub-basin, Iran, Vol. 2 No. 4, 362-372.
- [200]Farzaneh, M. R., Eslamian, S. S., Samadi, Z. and A. Akbarpour, 2012, An appropriate general circulation model (GCM) to investigate climate change impact, *International Journal of Hydrology Science and Technology*, Vol. 2, No. 1, 34-47.
- [201]Eslamian, S., Abedi-Koupai, J. and M. J. Zareian., 2012, Measurement and modelling of the water requirement of some greenhouse crops with artificial neural networks and genetic algorithm, *International Journal of Hydrology Science and Technology*, Vol. 2, No. 3, 237-251.
- [202]Sadeghi, S. H., Mousavi, S. F., Eslamian, S. S., Ansari, S. and F. Alemi, 2012, A Unified Approach for Computing Pressure Distribution in Multi-Outlet Irrigation Pipelines, *Iranian Journal of Science and Technology*, Vol. 36, No. C2, 209-223.
- [203]Alaghmand, S., Bin Abdullah, R., Abustan, I. and S. Eslamian, 2012, Comparison between capabilities of HEC-RAS and MIKE11 hydraulic models in river flood risk modeling (a case study of Sungai Kayu Ara River basin, Malaysia), *International Journal of Environmental Science and Technology*, Vol. 2, No. 3, 270-291.
- [204]Galoie, M., Zenz, G., S. Eslamian and A. Motamedi., 2012, Numerical simulation of flood due to dam-break flow using an implicit method, *International Journal of Environmental Science and Technology*, Vol. 2, No. 2, 117-137.
- [205]Ghazavi, R., A. B. Vali and S. Eslamian, 2012, Impact of Flood Spreading on Groundwater Level Variation and Groundwater Quality in an Arid Environment, *Water Resource Management*, Vol. 26, No. 6, 1651-1663.
- [206]Fakhri, M., Farzaneh, M. R., Eslamian, S. and M. J. Khordadi, 2012, Uncertainty Assessment of Downscaled Rainfall: Impact of Climate Change on the Probability of Flood, *Journal of Flood Engineering*, Vol. 3, No. 1, 19-28.
- [207]Gholami. A., Mahdavi, M. and S. Eslamian, 2012, Probability Distribution Choices for Minimum, Mean and Maximum Discharges, by L-Moments in Mazandaran Province, IRAN, *Journal of Flood Engineering*, Vol. 3, No. 1, 83-92.
- [208]Shaeri karimi, S., Yasi, M. and S. S. Eslamian, 2012, Use of Hydrological Methods for Assessment of Environmental Flow in a River Reach, *International Journal of Environmental Science and Technology*, 9(3), pp 549-558.
- [209]Eslamian, S. S., Hassanzadeh, H., Abedi-Koupai, J. and M. Gheysari, 2012, Application of L-moments for Regional Frequency Analysis of Monthly Drought Indices, *Journal of Hydrologic Engineering*, Vol. 17, No. 1, 32-42.
- [210]Farzaneh, M. R., Eslamian, S. S., Samadi, Z. and A. Akbarpour, 2012, An appropriate general circulation model (GCM) to investigate climate change impact, *International Journal of Hydrology Science and Technology*, Vol. 2, No. 1, 34-47.
- [211]Eslamian, S. S., Khordadi, M. J. and J. Abedi-Koupai, 2011, Effects of Variations In Climatic Parameters on Evapotranspiration In the Arid and Semi-Arid Regions, *Global and Planetary Change*, Vol. 78, 188–194.
- [212]Eslamian, S. S. and M. J. Amiri, 2011, Estimation of daily pan evaporation using adaptive neural-based fuzzy inference system, *International Journal of Hydrology Science and Technology*, Vol. 1, Nos. 3/4, 164-175.
- [213]Eslamian, S. S., Shaeri Karimi S. and F. Eslamian, 2011, A country case study comparison on Groundwater and Surface Water Interaction, *International Journal of Water*, Vol. 6, Nos. 1/2, 117-136.
- [214]Eslamian, S. S., Gohari, A., Zareian M. J. and A. Firoozfar, 2012, Estimating Penman-Monteith Reference Evapotranspiration Using Artificial Neural Networks and Genetic Algorithm: A Case Study, *The Arabian Journal for Science and Engineering*, Vol. 37, No. 4, 935-944.

- [215] Hassanzadeh, H., Eslamian, S. S., Abedi-Koupai, J. and M. Gheysari, 2011, Application of L-moment for evaluating drought indices of cumulative precipitation deficit (CPD) and maximum precipitation deficit (MPD) based on regional frequency analysis, *International Journal of Hydrology Science and Technology*, Vol. 1, Nos. 1/2, 88–104.
- [216] Alipour, M. H., Shamsai, A., Eslamian, S. S. and R. Ghasemizadeh, 2011, A new fuzzy technique to find the optimal solution in flood management, *Journal of Flood Engineering*, Vol. 2, No. 1, 1-9.
- [217] Ghasemizade, M., Mohammadi K., and S. S. Eslamian, 2011, Estimation of design flood hydrograph for an ungauged watershed, *Journal of Flood Engineering*, Vol. 2, No. 1/2, 27-36.
- [218] Dhital, Y. P., Kayastha, R. B. and S. S. Eslamian, 2011, Precipitation and discharge pattern analysis: a case study of Bagmati River basin, Nepal, *Journal of Flood Engineering*, Vol. 2, No. 1, 49-60.
- [219] Saatsaz, M., Sulaiman, W.N.A. and S. S. Eslamian, 2011, GIS DRASTIC model for groundwater vulnerability estimation of Astaneh-Kouchesfahan Plain, Northern Iran, *International Journal of Water*, Vol. 6, No. 1/2, 1-14.
- [220] Saatsaz, M., Chitsazan, M., Eslamian, S. S. and W.N.A. Sulaiman, 2011, The application of groundwater modelling to simulate the behaviour of groundwater resources in the Ramhormooz Aquifer, Iran, *International Journal of Water*, Vol. 6, Nos. 1/2, 29-42.
- [221] Kambona, O. O., Stadel, C. and S. S. Eslamian, 2011, Perceptions of tourists on trial use and management implications for Kakamega Forest, Western Kenya, *Journal of Geography and Regional Planning* Vol. 4, No. 4, 243-250.
- [222] Malekian, R., Abedi-Koupai, J., Eslamian, S. S., Mousavi, S. F., Abbaspour, K. C. and M. Afyuni, 2011, Ion-exchange process for ammonium removal and release using natural Iranian zeolite, *Applied Clay Science*, Vol. 51, 323–329.
- [223] Malekian, R., Abedi-Koupai, J. and S. S. Eslamian, 2011, Influences of clinoptilolite and surfactant-modified clinoptilolite zeolite on nitrate leaching and plant growth, *Journal of Hazardous Materials*, Vol. 185, 970–976.
- [224] Malekian, R., Abedi-Koupai, J. and S. S. Eslamian, 2011, Use of Zeolite and Surfactant Modified Zeolite as Ion Exchangers to Control Nitrate Leaching, *World Academy of Science, Engineering and Technology*, Vol. 76, 657-661.
- [225] Zaky, M. M. M., Salem, M. A. M., Persson, K. M. M. and S. S. Eslamian, 2011, Incidence of *Aeromonas* species isolated from water and fish sources of Lake Manzala in Egypt, *International Journal of Hydrology Science and Technology*, Vol. 1, Nos. 1/2, 47–62.
- [226] Khorsandi, Z., Mahdavi, M., Salajeghe, A. and S. S. Eslamian, 2011, Neural Network Application for Monthly Precipitation Data Reconstruction, *Journal of Environmental Hydrology*, Vol. 19, Paper 5, 1-12.
- [227] Eslamian, S. S., 2010, The Physically-Statistically Based Region of Influence Approach for Flood Regionalization, *Journal of Flood Engineering*, Vol. 1, No. 2, 149-158.
- [228] Eslamian, S. S., 2010, Flood Regionalization Using a Modified Region of Influence Approach, *Journal of Flood Engineering*, Vol. 1, No. 1, 51-66.
- [229] Eslamian, S. S., Ghasemizadeh, M., Biabanaki, M. and M. Talebizadeh, 2010, A principal component regression method for estimating low flow index, *Water Resources Management*, Vol. 24, No. 11, 2553-2566.
- [230] Amiri, M. J. and S. S. Eslamian, 2010, Investigation of climate change in Iran, *Journal of Environmental Science and Technology*, Vol. 3, No. 4, 208-216.
- [231] Ghazavi, R., Vali, A. B. and S. S. Eslamian, 2010, Impact of flood spreading on infiltration rate and soil properties in an arid environment, *Water Resources Management*, Vol. 24, No. 11, 2781-2793.
- [232] Rajabi, A., Sedghi, H., Eslamian, S. S. and H. Musavi, 2010, Comparison of Lars-WG and SDSM downscaling models in Kermanshah (Iran), *Ecol. Env. & Cons.*, Vol. 16, No. 4, 1-7.
- [233] Rahnamai Zekavat, P., Ghasemizadeh, R., Eslamian, S. S. and S. Tarkesh Isfahani, 2010, *Journal of Flood Engineering*, Vol. 1, No. 2, 175-184.
- [234] Chavoshi Borujeni, S., Sulaiman, W. N. A. and S. S. Eslamian, 2010, Regional Flood Frequency Analysis Using L-Moments for North Karoon Basin Iran, *Journal of Flood Engineering*, Vol. 1, No. 1, 67-76.
- [235] Kloub, N., Matouq, M., Krishan, M., Eslamian, S. S. and M. Abdelhadi, 2010, Monitoring of Water Resources Degradation at Al-Azraq Oasis, Jordan Using Remote Sensing and GIS Techniques, *International Journal of Global Warming*, Vol. 2, No. 1, 1-16.
- [236] Akhavan S., Abedi-Koupai, J., Mousavi, S. F., Afyuni, M., Eslamian, S. S. and K. C. Abbaspour, 2010, Application of SWAT model to investigate nitrate leaching in Hamadan–Bahar Watershed, Iran, *Agriculture, Ecosystems and Environment*, Vol. 139, 675-688.
- [237] Eslamian, S. S., Abedi-Koupai, J., Amiri, M. J., and A. R. Gohari, 2009, Estimation of Daily Reference Evapotranspiration Using Support Vector Machines and Artificial Neural

- Networks in Greenhouse, Research Journal of Environmental Sciences, Vol. 3, No. 4, 439-447.
- [238] Eslamian, S. S. and N. Lavaei, 2009, Modelling Nitrate Pollution of Groundwater using Artificial Neural Network and Genetic Algorithm in an Arid Zone, International Journal of Water, Special Issue on Groundwater and Surface Water Interaction (GSWI), Vol. 5, No. 2, 194-203.
- [239] Eslamian, S. S. and M. J. Khordadi, 2009, Comparing Rainfall and Discharge Trends in Karkhe Basin, Iran, International Journal of Ecological Economics & Statistics (IJEES), Vol. 15, No. F09, 114-122.
- [240] Eslamian, S. S. and B. Nekouineghad, 2009, A Review on Interaction of Groundwater and Surface Water, International Journal of Water, Special Issue on Groundwater and Surface Water Interaction (GSWI), Vol. 5, No. 2, 82-99.
- [241] Eslamian, S. S. and N. Zamani, 2009, Innovations in Wind Modelling, International Journal of Global Energy Issues, Special Issue on Wind Modelling and Frequency Analysis (WMFA), Vol. 32, No. 3, 175-190.
- [242] Eslamian, S. S. and H. Hasanzadeh, 2009, Detecting and Evaluating Climate Change Effect on Frequency Analysis of Wind Speed in Iran, International Journal of Global Energy Issues, Special Issue on Wind Modelling and Frequency Analysis (WMFA). Vol. 32, No. 3, 295 – 304.
- [243] Eslamian, S. S., 2009, Editorial: Frontiers in Ecology and Environment, International Journal of Ecological Economic & Statistics, Special Issue on Basin Ecology and Environment (BEE), Vol. 13, No. W09, 1-6.
- [244] Eslamian, S. S. and M. Biabanaki, 2009, Low Flow Regionalization Models, International Journal of Ecological Economic & Statistics, Special Issue on Stream Ecology and Low Flows (SELF), Vol. 12, No. F08, 82-97.
- [245] Eslamian, S. S., 2009, Editorial: An Ecologically Based Low Flow Review, International Journal of Ecological Economic & Statistics, Special Issue on Stream Ecology and Low Flows (SELF), Vol. 12, No. F08, 1-6.
- [246] Nosrati, K., Eslamian, S. S., Shahbazi, A., Malekian, A. and M. M. Saravi, 2009, Application of Daily Water Resources Assessment Model for Monitoring Water Resources Indices, International Journal of Ecological Economic & Statistics, Special Issue on Basin Ecology and Environment (BEE), Vol. 13, No. W09, 88-99.
- [247] Abedi-Koupai, J., Amiri, M. J., and S. S. Eslamian, 2009, Comparison of Artificial Neural Network and Physically Based Models for Estimating of Reference Evapotranspiration in Greenhouse, Australian Journal of Basic and Applied Sciences, Vol. 3, No. 3, 2528-2535,
- [248] Ebrahimizadeh, M. A., Amiri, M. J., Eslamian, S. S., Abedi-Koupai, J. and M. Khozaei, 2009, The Effects of Different Water Qualities and Irrigation Methods on Soil Chemical Properties, Research Journal of Environmental Sciences, Vol. 3, No. 4, 497-503.
- [249] Matouq, M., Amarneh, I. A., Kloub, N., Badran, O., Al-Duheisat, S. A. and S. S. Eslamian, 2009, Investigating the Effect of Combustion of Blending Jordanian Diesel Oil with Kerosene on Reducing the Environmental Impacts by Diesel Engine, International Journal of Ecological Economic & Statistics, Special Issue on Basin Ecology and Environment (BEE), Vol. 13, No. W09, 79-87.
- [250] Eslamian S. S., Gohari, A., Biabanaki, M. and R. Malekian, 2008, Estimation of Monthly Pan Evaporation Using Artificial Neural Networks and Support Vector Machines, Journal of Applied Sciences, Vol. 7, No. 19, 2900-2903.
- [251] Abedi-Koupai J., Eslamian S. S. and J. Asad Kazemi, 2008, Enhancing the available Water Content in Unsaturated Soil Zone using Hydrogel, to Improve Plant Growth Indices, Ecohydrology and Hydrobiology, Vol. 8, No. 1, 3-11.
- [252] Bazgeer, S., Kamali, G. A., Eslamian, S. S., Sedaghatkardar, A. and I. Moradi, 2008, Pre-Harvest Wheat Yield Prediction Using Agrometeorological Indices for Different Regions of Kordestan Province, Iran, Research Journal of Environmental Sciences, Vol. 2, No. 4, 275-280.
- [253] Eslamian, S. S. and H. Feizi, 2007, Maximum Monthly Rainfall Analysis Using L-moments for an Arid Region in Isfahan Province, Iran, Journal of Applied Meteorology and Climatology, Vol. 46, No. 4, 494-503.
- [254] Modarres, R., Soltani, S. and S. S. Eslamian, 2007, The Use of Time Series Modeling for the Determination of Rainfall Climates of Iran, International Journal of Climatology, Vol. 27, No. 6, 819-829.
- [255] Moradi, I., Nosrati, K. and S. S. Eslamian, 2007, Evaluation of the RadEst and ClimGen Stochastic Weather Generators for Low-Medium Rainfall Regions, Journal of Applied Sciences, Vol. 7, No. 19, 2900-2903.
- [256] Modarres R. and S. S. Eslamian, 2006, Streamflow Time Series Modeling of Zayandehrud River, Iranian Journal of Science and Technology, Vol. 30, No. B4, 567-570.
- [257] Mostafazadeh-fard, B., Osroosh, Y. and S. S. Eslamian, 2006, Development and Evaluation of an Automatic Surge Flow Irrigation System, Journal of Agriculture and Social Sciences, Vol. 2, No. 3, 129-132.

- [258]Eslamian, S. and F. Eslamian, 2017, Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Francis and Taylor, CRC Group, USA, 660 Pages.
- [259]Eslamian, S. and F. Eslamian, 2017, Handbook of Drought and Water Scarcity, Vol. 2: Environmental Impacts and Analysis of Drought and Water Scarcity, Francis and Taylor, CRC Group, USA, 680 Pages.
- [260]Eslamian, S. and F. Eslamian, 2017, Handbook of Drought and Water Scarcity, Vol. 3: Management of Drought and Water Scarcity, Francis and Taylor, CRC Group, USA, 645. Pages.
- [261]Angelakis, A. N., Chiotis, E., Eslamian, S., Weingartner, H., 2017, Underground Aqueducts Handbook, Taylor and Francis Group, CRC Press, USA, 511 Pages.
- [262]Zalewski, M., McClain, M. E., and Eslamian, S., 2016, New Challenges and Dimensions of Ecohydrology, Part II Ecohydrology and Hydrobiology, Special Issue, Volume 16, Issue 2, Pages 71-124, Elsevier.
- [263]Zalewski, M., McClain, M. E., and Eslamian, S., 2016, New Challenges and Dimensions of Ecohydrology, Part I, Ecohydrology and Hydrobiology, Special Issue, Volume 16, Issue 1, Pages 1-70, Elsevier.
- [264]Godarzi, A., Eslamian, S., Ostad-Ali-Askari, K., 2016, Water in Literature Aspects: Social and Cultural Aspects, Nashreshahr, 135 Pages.
- [265]Eslamian, S., Ostad-Ali-Askari, K., Salehi, M., Agha-Esmali, M., Sadeghi, M., Navabpour, B., Mohri-Esfahani, E., Mousavi-Madani, M., Zad-Bagher-Seighalani, E., Sadri, A., Shirvani-Dastgerdi, H. R., 2016, Engineering Operations Research: Linear Planning, Optimization and Genetic Algorithm, Kankash, 126 Pages.
- [266]Eslamian, S., Ostad-Ali-Askari, K., Shayannejad, M., Ghasemi-Zeniani, M., Marzi-Nohadani, M., Heidari, F., Mohri-Esfahani, E., Haeri-Hamadani, M., 2016., Groundwater Hydrodynamic, Horoufchin, 193 Pages.
- [267]Ostad-Ali-Askari, K., Shayannejad, M., Eslamian, S., Jahangiri, A. A., Shabani, A. H., 2016, Environmental Hydraulics of Open Channel Flows, Kankash, 332 Pages.
- [268]Eslamian, S. S. and R. Mirabbasi, 2017, Application of Statistical Methods in Water Sciences, Aeij Publishing, Tehran, Iran, Under Press.
- [269]Eslamian, S, 2015, (ed.) Urban Water Reuse Handbook, Francis and Taylor, CRC Group, USA, 1141 Pages.
- [270]Eslamian, S., 2014, (ed.) Handbook of Engineering Hydrology, Vol. 1: Fundamentals and Applications, Taylor and Francis, CRC Group, USA, 636 Pages.
- [271]Eslamian, S., 2014, (ed.) Handbook of Engineering Hydrology, Vol. 2: Modeling, Climate Change and Variability, Taylor and Francis, CRC Group, USA, 646 Pages.
- [272]Eslamian, S., 2014, (ed.) Handbook of Engineering Hydrology, Vol. 3: Environmental Hydrology and Water Management, Taylor and Francis, CRC Group, USA, 606 Pages.
- [273]Eslamian, S. S., 2013, Groundwater and Surface Water Interaction (GSWI): 3: Unconventional Groundwater, International Journal of Water, Special Issue Volume, Indersciences, Vol. 7, No. 1/2, 1-141.
- [274]Eslamian, S. S., 2011, Groundwater and Surface Water Interaction (GSWI): 2. Case Studies, International Journal of Water, Special Issue Volume, Indersciences, Vol. 6, No. 1, 1-136.
- [275]Eslamian, S. S., and S. Tarkesh Esfahani, 2011, Water Reuse (Urban Waste Water Application), Arkan Danesh Publishing, Isfahan, Iran, 327 Pages.
- [276]Sharifani, M. M. and S. S. Eslamian, 2010, Humid Region Fruit Trees, Aeij Publishing, Tehran, Iran.
- [277]Eslamian, S. S., 2009, Basin Ecology and Environment (BEE), International Journal of Ecological Economic & Statistics, Ed., Special Issue Volume, CESER, Vol. 13, No. W09, 1-99.
- [278]Eslamian, S. S., 2009, Groundwater and Surface Water Interaction (GSWI): 1. Quality, International Journal of Water, Special Issue Volume, Indersciences, Vol. 5, No. 2, 81-204.
- [279]Eslamian, S. S., 2009, Wind Modeling and Frequency Analysis (WMFA), International Journal of Global Energy Issues, Special Issue Volume, Indersciences. Vol. 32, No. 3, 175-304.
- [280]Eslamian, S. S., 2008, Stream Ecology and Low Flows (SELF), International Journal of Ecological Economic & Statistics, Ed., Special Issue Volume, CESER, Vol. 12, No. F08, 1-97.
- [281]Eslamian, S. S., Soltani S. and A. Zarei, 2005, Application of Statistical Methods in Environmental Sciences, Arkan Publishing, Isfahan, Iran, 408 p.
- [282]Eslamian, S. S. and S. Soltani, 2002, Flood Frequency Analysis, Arkan Publishing, Isfahan, Iran, 332 p.
- [283]Eslamian, S. S., 1995, Regional Flood Frequency Analysis Using a New Region of Influence Approach, Ph.D. Thesis, Univ. of New South Wales, School of Civil Engineering, Dept. of Water Engineering, Sydney, NSW, Australia, 1995, Supervised by: Professor David H. Pilgrim, 380 P.
- [284]Coles, N. A. and Eslamian, S., 2017, Definition of Drought, Ch. 1 in Handbook of Drought and

- Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 1-12.
- [285] Dalezios, N. R., Dunkel, Z., Eslamian, S., 2017, Meteorological Drought Indices: Definitions, Ch. 3 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 24-44.
- [286] Goyal, M. K. Gupta, V., Eslamian, S., 2017, Hydrological Drought: Water Surface and Duration Curve Indices, Ch. 4 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 45-72.
- [287] Dalezios, N. R., Gobin, A., Tarquis Alfonso, A. M., and Eslamian, S., 2017, Agricultural Drought Indices: Combining Crop, Climate, and Soil Factors, Ch. 5 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 73-90.
- [288] TishehZan, P. and Eslamian, S., 2017, Agricultural Drought: Organizational Perspectives, Ch. 6 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 91-108.
- [289] Bazrkar, M. H., Eslamian, S., 2017, Ocean Oscillation and Drought Indices: Application, Ch. 8 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 127-136.
- [290] Basu, R., Singh, C. K., Eslamian, S., 2017, Cause and Occurrence of Drought, Ch. 9 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 137-148.
- [291] Bazrafshan, J., Hejabi, S., Eslamian, S., 2017, Drought Modeling Examples, Ch. 11 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 167-188.
- [292] Jonathan Peter Cox, Sara Shaeri Karimi, Eslamian, S., 2017, Real-Time Drought Management, Ch. 13 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 209-216.
- [293] Garg, V. and Eslamian, S., 2017, Monitoring, Assessment, and Forecasting of Drought Using Remote Sensing and the Geographical Information System. Ch. 14 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 217-252.
- [294] Dalezios, N. R., Tarquis Alfonso, A. M., and Eslamian, S., 2017, Drought Assessment and Risk Analysis, Ch. 18 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 323-344.
- [295] Dalezios, N. R., Spyropoulos, N. V., Eslamian, S., 2017, Remote Sensing in Drought Quantification and Assessment, Ch. 21 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 377-396.
- [296] Araghinejad, S., Hosseini-Moghari, S. M., Eslamian, S., 2017, Application of Data-Driven Models in Drought Forecasting, Ch. 23 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 423-440.
- [297] Vafakhah, M., and Eslamian, S., 2017, Application of Intelligent Technology in Rainfall Analysis, Ch. 24 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 441-460.
- [298] Vafakhah, M., Akbari Majdar, H. and Eslamian, S., 2017, Rainfall Prediction Using Time Series Analysis, Ch. 28 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 517-540.
- [299] González, M. H., Garbarini, E. M., Rolla, A. L., and Eslamian, S., 2017, Meteorological Drought Indices: Rainfall Prediction in Argentina, Ch. 29 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 541-570.
- [300] Hadizadeh, R. and Eslamian, S., 2017, Modeling Hydrological Process by ARIMA-GARCH Time Series, Ch. 30 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 571-590.
- [301] Mujere, N., Yang, X. and Eslamian, S., 2017, Gradation of Drought-Prone Area, Ch. 31 in

Investigation of Wetland Performance for Sewage Treatment in Rural Areas

- Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 591-606.
- [302]Mahmudul Haque, M., Amir Ahmed, A., Rahman, A., Eslamian, S., 2017, Drought Losses to Local Economy, Ch. 33 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 627-642.
- [303]Fakhruddin, B. S. H. M., Eslamian, S., 2017, Analysis of Drought Factors Affecting the Economy, Ch. 34 in Handbook of Drought and Water Scarcity, Vol. 1: Principles of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 643-656.
- [304]Dalezios, N. R., Eslamian, S., 2017, Environmental Impacts of Drought on Desertification Classification, Ch. 3 in Handbook of Drought and Water Scarcity, Vol. 2: Environmental Impacts and Analysis of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 45-64.
- [305]Nazif, S. and Tavakolifar, H., Eslamian, S., 2017, Climate Change Impact on Urban Water Deficit, Ch. 5 in Handbook of Drought and Water Scarcity, Vol. 2: Environmental Impacts and Analysis of Drought and Water Scarcity, Ed. by Eslamian S. and Eslamian F., Francis and Taylor, CRC Press, USA, 81-106.

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