Contents

Part I  Purification and Reuse of Wastewaters in Rural Communities

1  Wastewater Problems in Rural Communities, Their Influence on Sustainable Management in Protected Areas .......................... 3  J.L. Corvea, Y. Martínez, A. Blanco, I. de Bustamante, and J.M. Sanz

2  Wastewater Treatment and Reuse as a Tool for the Social and Environmental Improvement of Populations Within Protected Environments ........................................ 11  A. de Miguel, J.M. Sanz, I. de Bustamante, A. de Tomás, and J.L. Goy

3  Systems Design of Wastewater Treatment by Extensive Purification Technologies: Application in Chiapas, Mexico .................. 21  M. Navarro and I. de Bustamante

4  Proposal of a Slow Filter of Sand for the Treatment of Water at House Level in Protected Areas ........................................ 29  L. Ramírez Medina, N.S. Pérez Duarte, and G. Barrera Ramos

Part II  Impact of Public Use on Water Resources

5  Environmental Impact of Human Activities on Water Resources and Its Characterization for Management and Planning of Natural Areas “Las Batuecas-Sierra Francia” and “Quilamas” (Salamanca, Spain) ......................................................... 39  A.M. Martínez-Graña, J.L. Goy Goy, I. de Bustamante Gutiérrez, and C. Zazo Cardeña

6  Human Effect Over the Chemical Denudation Development in the Coastal Limestone Aquifer, Havana Southern Plane, Cuba .... 47  J.R. Fagundo Castillo, J. Pajón Morejón, P. González Hernández, M. Suárez Muñoz, and C. Melián Rodríguez
7 Hydrogeochemical Processes Effect Over the Water Quality in the Coastal Limestone Aquifer of Güira-Quivicán, Havana Southern Plane, Cuba .................................................. 57

Part III Vulnerability and Risk of Aquifers

8 Characterization of the Vulnerability to the Contamination in Defined Areas of the Vento Aquifer, Validated with Geophysical Methods .................................................. 69
I. Pedroso Herrera, M.J. Fundora, F. Méndez, M. Guerra, and I. González

9 Assessing the Vulnerability of Groundwater Pollution at Sensitive Areas by Geophysical Methods ............................................. 77
Y. Díaz, M. Himi, J.C. Tapías, L. Rivero, X. Font, and A. Casas

10 Mapping Groundwater Vulnerability in Guanahacabibes National Park, Western of Cuba .................................................. 87
C. Díaz-Guanche, C. Aldana-Vilas, and H. Farfán-González

11 First Outcomes in the Application of PaPRIKa Method to Assess Aquifer Vulnerability in Tropical Karst Mountain: Santo Tomás Watershed: Viñales National Park, Cuba .................. 95
H. Farfán González and V. Plagnes

12 Assessment of Groundwater Protection Zones at the Viñales National Park, Cuba .................................................. 103
H. Farfán, J.L. Corvea, and I. de Bustamante

Part IV Design and Management Water Resources in Protected Areas

13 Flood Hazard Mapping of the Yeltes River Basin for Planning of Natural Spaces “Los Batuecas-Sierra de Francia” and “Quilamas” and Their Area of Influence (Salamanca, Spain) .................. 113
A.M. Martínez-Graná, J.L. Goy-Goy, and C. Zazo Cardeña

14 Estimation of Water Excess in the Medium and High Basins of Yanuncay River (Cuenca-Ecuador) by Approximation of Monthly: Distributed Water Balance ............................................. 121
J. Fernández de Córdova W. and J.A. Pascual

15 Sustainable Management of Hydraulic Resources in Sagua la Grande Basin (Villa Clara Province, Cuba), a Simulation Model with Systems Dynamics .................................................. 129
L. Bucarano Montano and J.I. Yeras Díaz-Veliz
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Water Resources Management in Small Mountain Watersheds in the Humid Tropics: The Hydrologic System of the Santo Tomas Cave System, Pinar del Rio, Cuba</td>
<td>137</td>
</tr>
<tr>
<td>17</td>
<td>The Relationship Between Surface Waters and Groundwaters in the Coastal Wetlands of Campo de Dalías (Almería, SE Spain) and Their Importance for Sustainable Water Management</td>
<td>145</td>
</tr>
<tr>
<td>19</td>
<td>3D Detrital Aquifer Modelling for Water Resources Management of the Regional Park of the Lower Courses of Manzanares and Jarama Rivers (Madrid, Spain)</td>
<td>161</td>
</tr>
</tbody>
</table>

Part V  Research and Monitoring of Water Resources in Protected Areas

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Preliminary Characterization of the Hydrodynamic of Karst Aquifer in the “Promontorio de Cabrera”, Province of Maria Trinidad Sánchez, Dominican Republic</td>
<td>171</td>
</tr>
<tr>
<td>21</td>
<td>Underground Water of Deep Circulation in the National Park Guanahacabibes, Pinar del Rio Province, Cuba: Another Alternative with Water Supply Aims</td>
<td>179</td>
</tr>
<tr>
<td>22</td>
<td>Aquifer Recharge Capacity in the Protected Area South of the Basin of Mexico</td>
<td>187</td>
</tr>
<tr>
<td>23</td>
<td>Obtaining Hydrological Indicators by Analysing the Flow Conversion of Rainfall in Basins of the Mediterranean Coastline, Alicante Province, Spain</td>
<td>195</td>
</tr>
<tr>
<td>24</td>
<td>The Influences of Precipitations Variability in the Surface Runoff of Hanábanal Catchment, Main Contributor of the Largest Wetland in Cuba</td>
<td>203</td>
</tr>
<tr>
<td>25</td>
<td>Geochemistry of Waters from Tropical Karst Mountain of Western Cuba</td>
<td>211</td>
</tr>
</tbody>
</table>
26 Aspects of the Thermodynamics and Kinetics of the System CO₂-H₂O-Carbonates in Tropical Karst Mountain of Western Cuba .......................... 221
J.M. Pajón and J.R. Fagundo

27 “MODELAGUA”: An Interactive Program of Inverse Mass-Balance Model for Geochemical Study: An Example of its Application in Aguascalientes, Mexico .......................... 233

28 Hydrochemical Evaluation of La Gomera Aquifers (Canary Islands) and its Relationship to Garajonay National Park .............. 243
M. Leal, J. Lillo, and Á. Márquez

29 Contamination and Protection of Surface Water Source in Czech Republic ................................................................. 253
P. Oppeltová

30 Behavior of Fecal Contamination Indicators in Waters of the Tourist Complex “Las Terrazas”, Pinar del Río, Cuba .......... 263
J.A. Larrea Murrell, M.M. Rojas Badía, D. Lugo Moya, and M. Heydrich Pérez

31 Preliminary Considerations About the Bacteriological Quality of the Water Used for Human and Animal Consumption at El Tibisí, Pinar del Río, Cuba ........................................... 271

32 Presence of Illicit Drugs in Surface Waters of Protected Natural Wetlands Connected to Traditional Irrigation Systems and Urban Areas ................................................................. 277
J.A. Pascual Aguilar, V. Andreu, P. Vázquez, and Y. Picó

33 Influence of Interactions of Surface Waters: Groundwaters on the Chemistry of Surface Waters in the River Andarax Catchment (Almería, SE Spain) ................................................... 285

34 Chemical-Physical Evaluation of the Superficial Waters in Areas with Miner-Metallurgic Activity in Santa Lucía, Pinar del Río . . 293
D. Gallardo Martinez, I. Cabrera, N. Brugueru Amaran, J.A. Alonso, A. Pinto, E. Milian Milian, and A. Rodríguez Ramos

35 Seawater Intrusion in the Coastal Aquifer of Guanahacabibes, Pinar del Río, Cuba ........................................................... 301
36 Seasonal Dynamic of the Vegetation at “Los Carneros” Lagoon: Handled Floral Reserve Sabanalamar-San Ubaldo, Pinar del Río, Cuba ................................................................. 309
V. Pérez

Part VI  Information, Popularization and Training

37 Toward the Sustainable Use of Water in Cuba .................. 319
J.A. Díaz Duque

38 Geodiversity and Hydrological Patrimony in High Mountain Areas. Gredos Range: Béjar and El Barco Massifs, Spain. Inventory and Cataloguing ......................................................... 329
R. Cruz, J.L. Goy, and Cardeña Zazo

39 Observations About the Geology of Western Cuba, Most Significant Aquifers, and the Geomorphology of its Catching Landforms .... 339
R. Gutiérrez Domech

40 The Importance of the Alexander von Humboldt’s Work “Island of Cuba” to the Study of Caves in Cuban Territory .... 347
L.E. Panisset Travassos

Index ................................................................. 353
Management of Water Resources in Protected Areas
Farfán González, H.; Corvea Porras, J.L.; de Bustamente Gutiérrez, I.; LaMoreaux, J.W. (Eds.)
2013, XVII, 363 p., Hardcover
ISBN: 978-3-642-16329-6