applied sciences

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Editorial

Special Issue on Climate Change and Water Resources

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Received: 6 April 2020; Accepted: 11 April 2020; Published: 19 April 2020

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Keywords: precipitation; hydrology; water management; climate change; decision support

This Special Issue of the Earth Sciences and Geography section of *Applied Sciences* sought to bring together timely contributions in the area of climate change and water resources. This is a broad topic that encompasses atmospheric and land surface science, agronomy, economics, political science, and other disciplines, both theoretical and applied. Indeed, the accepted papers span most of this range, and provide a sense of the diversity of problems faced by scientists and engineers in these fields as global warming exceeds 1 °C and unprecedented drought and flood extremes are being recorded each year.

The contribution of Soldatenko [1] is on the physics side of the issue topic. It develops and analyzes simple models of atmospheric circulation and the effect of an imposed warming pattern due to greenhouse gas accumulation. It finds that warming tends to increase eddy moisture transport into the midlatitudes, which may strengthen frontal systems that generate storms. These kinds of results can be useful for providing guidance on expected long-term changes in hydroclimate.

Dars et al. [2] model in much greater detail climate over a defined area in South Asia, the Upper Indus Basin, and compare the result with station observations. The study area is one vulnerable to damaging hydrologic extremes, likely to be exacerbated by climate change. The presented work furthers understanding of how to simulate changing hydrologic processes in this critical region and suggests to specialists directions for improvement of such simulations.

Jamro et al. [3] overlap with the previous study in area and time period. This work focuses more on analyzing an observation-based data set to understand climatology and trends of droughts. While not offering as much insight into future processes, this kind of study provides more directly relevant information on risks based on recent experience.

Hashim et al. [4] rely on remote sensing to monitor long-term change in vegetation cover over the marshes in southern Iraq, an ecologically key area that has suffered from anthropogenic water withdrawals in a setting of war and conflict, as well as adverse impacts of global warming. Earth-observing satellites offer unique vantage points on changing hydrologic processes, which, as in the present case, can provide valuable information for managing resources.

Barbulescu et al. [5] evaluate a new computational method for interpolating heavy-rainfall levels over eastern Romania. This work is a good example of the centrality of spatiotemporal statistics tools in hydrological applications. These tools can enable drawing better inferences from limited and uncertain observations, such as rainfall from a few stations.

Moving from physical science to a more social science analysis, Xia et al. [6] attempt to relate subnational population changes within Mexico and Ethiopia to simulated crop yield anomalies due to climate variability. While preliminary, these findings highlight that hydrologic extremes like flood and drought affect livelihoods and may result in mass migration, or alternatively make resources unavailable for travel, and thus also impact water supplies and management elsewhere.

Similarly, Lee and Choi [7] concentrate on vulnerability to flooding. They apply the climate change vulnerability assessment conceptual framework at the district level for South Korea. They carefully consider differences between several previously suggested formulations, and propose

that the indicators employed should be selected to reflect the purpose and function of the vulnerability assessment.

Finally, Martinez-Acosta et al. [8] present the most engineering-oriented contribution to this special issue. They provide a comprehensive review of rainwater harvesting systems for agricultural applications, which provide an invaluable means of adapting to changing climate in many settings. This work highlights factors that typically need to be considered in designing an effective rainwater harvesting system, including climate conditions, terrain, and soil properties.

Overall, the articles of this issue give enlightening glimpses of the state of the art of work on climate change and water resources. A plethora of disciplines, methods, and geographic settings are in evidence, enabling effective consideration of a wide array of resource and hazard challenges and types of responses.

Acknowledgments: I thank the contributors to this Special Issue, and especially the peer reviewers, who helped improve the quality of the accepted papers through detailed critiques. I also thank Emily Zhang and the MDPI staff for ably supporting each step of the Special Issue, from conception to completion.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Soldatenko, S. Estimated Impacts of Climate Change on Eddy Meridional Moisture Transport in the Atmosphere. *Appl. Sci.* **2019**, *9*, 4992, doi:10.3390/app9234992. [CrossRef]
2. Dars, G.H.; Strong, C.; Kochanski, A.K.; Ansari, K.; Ali, S.H. The Spatiotemporal Variability of Temperature and Precipitation Over the Upper Indus Basin: An Evaluation of 15 Year WRF Simulations. *Appl. Sci.* **2020**, *10*, 1765, doi:10.3390/app10051765. [CrossRef]
3. Jamro, S.; Dars, G.H.; Ansari, K.; Krakauer, N.Y. Spatio-Temporal Variability of Drought in Pakistan Using Standardized Precipitation Evapotranspiration Index. *Appl. Sci.* **2019**, *9*, 4588, doi:10.3390/app9214588. [CrossRef]
4. Hashim, B.M.; Sultan, M.A.; Attyia, M.N.; Al Maliki, A.A.; Al-Ansari, N. Change Detection and Impact of Climate Changes to Iraqi Southern Marshes Using Landsat 2 MSS, Landsat 8 OLI and Sentinel 2 MSI Data and GIS Applications. *Appl. Sci.* **2019**, *9*, 2016, doi:10.3390/app9102016. [CrossRef]
5. Barbulescu, A.; Bautu, A.; Bautu, E. Optimizing Inverse Distance Weighting with Particle Swarm Optimization. *Appl. Sci.* **2020**, *10*, 2054, doi:10.3390/app10062054. [CrossRef]
6. Xia, H.; Adamo, S.B.; de Sherbinin, A.; Jones, B. The Influence of Environmental Change (Crops and Water) on Population Redistribution in Mexico and Ethiopia. *Appl. Sci.* **2019**, *9*, 5219, doi:10.3390/app9235219. [CrossRef]
7. Lee, J.S.; Choi, H.I. Comparative Analysis of Flood Vulnerability Indicators by Aggregation Frameworks for the IPCC's Assessment Components to Climate Change. *Appl. Sci.* **2019**, *9*, 2321, doi:10.3390/app9112321. [CrossRef]
8. Martínez-Acosta, L.; López-Lambraño, A.A.; López-Ramos, A. Design Criteria for Planning the Agricultural Rainwater Harvesting Systems: A Review. *Appl. Sci.* **2019**, *9*, 5298, doi:10.3390/app9245298. [CrossRef]