Application of Distributed Ledger Platforms in Smart Water Systems

There are numerous peer-reviewed publications, reports, and general education materials that focus on explaining the IoT and Blockchain technologies, proposing specific architectural designs for a particular application, and reviewing relevant literature. Our search withing Google Scholar with keywords such as “Blockchain,” “IoT,” “Water Management,” and a combination of them resulted in more than a few hundred articles as our initial depository. We set a citation alert and monitored recent publications to add the most relevant work to our references. In total, we reviewed 204 publications and cited 95 articles that we found most relevant to the purpose of this study. We had to forego technical publications, mainly in the field of computer science and information technology which are outside our expertise area. We did not include unpublished work, industry briefs, and not peer-reviewed materials in this report. We also excluded studies that documented the application of IoT and Blockchain technology in precision agriculture, food traceability, environmental control, and supply chain management.

Of 95 articles that we used, 67 articles are organized as the main part of this literature review study based on three application topics: *Smart Water Systems*, *Water Quality Monitoring*, and *Storm Water Management*. To be more specific, we used 27 peer-reviewed articles to highlight the application of IoT and Blockchain in smart water systems, 31 articles in water quality monitoring, and nine articles focusing on stormwater management. The following list includes the citations in our work based on the main topics to make it easier for our readers to find a specific reference. We also list those searched but excluded works for the purpose of clarity.

Blockchain and IoT

Ahram, Tareq, Arman Sargolzaei, Saman Sargolzaei, Jeff Daniels, and Ben Amaba. 2017.

"Blockchain Technology Innovations." In *IEEE Technology & Engineering Management Conference (TEMSCON)*, 137-41.

Akram, Shaik V., Praveen K. Malik, Rajesh Singh, Gehlot Anita, and Sudeep Tanwar. 2020. "Adoption of blockchain technology in various realms: Opportunities and challenges." In, e109. Wiley.

Bassoo, V., V. Ramnarain-Seetohul, V. Hurbungs, T. P. Fowdur, and Y. Beeharry. 2018. "Big Data Analytics for Smart Cities." In *Internet of Things and Big Data Analytics Toward Next-Generation Intelligence*, 359-79.

Brotsis, Sotirios, Konstantinos Limniotis, Gueltoum Bendiab, Nicholas Kolokotronis, and Stavros Shiaeles. 2021. "On the suitability of blockchain platforms for IoT applications: Architectures, security, privacy, and performance." *Computer Networks*. doi: 10.1016/j.comnet.2021.108005.

Christidis, Konstantinos, and Michael Devetsikiotis. 2016. "Blockchains and Smart Contracts for the Internet of Things." In, 2292-303. Institute of Electrical and Electronics Engineers Inc.

Dogo, Eustace M., Abdulazeez Femi Salami, Clinton O. Aigbavboa, and Thembinkosi Nkonyana. 2019. "Taking Cloud Computing to the Extreme Edge: A Review of Mist Computing for Smart Cities and Industry 4.0 in Africa." In *Edge Computing*, 107-32.

Düdder, Boris, Vladislav Fomin, Tan Gürpinar, Michael Henke, Mubashar Iqbal, Viktorija Janavičienė, Raimundas Matulevičius, Natalia Straub, and Haiqin Wu. 2021. "Interdisciplinary Blockchain Education: Utilizing Blockchain Technology From Various Perspectives." *Frontiers in Blockchain* 3. doi: 10.3389/fbloc.2020.578022.

Kumar, Nallapaneni Manoj, and Pradeep Kumar Mallick. 2018. "Blockchain technology for security issues and challenges in IoT." *Procedia Computer Science* 132:1815-23. doi: 10.1016/j.procs.2018.05.140.

Marchese, Dayton, and Igor Linkov. 2017. "Can You Be Smart and Resilient at the Same Time?" *Environmental Science & Technology* 51 (11):5867-8. doi: 10.1021/acs.est.7b01912.

Nakamoto, Satoshi. 2008. "Bitcoin: A Peer-to-Peer Electronic Cash System."

Qatawneh, Mohammad, Wesam Almobaideen, and Orieb AbuAlghanam. 2020. "Challenges of Blockchain Technology in Context Internet of Things: A Survey."

Reyna, Ana, Cristian Martín, Jaime Chen, Enrique Soler, and Manuel Díaz. 2018. "On blockchain and its integration with IoT. Challenges and opportunities." *Future Generation Computer Systems* 88:173-90. doi: 10.1016/j.future.2018.05.046.

Rose, K., S. Eldridge, and L. Chapin. 2015. "The Internet of Things: An Overview - Understanding the Issues and Challenges of a More Connected World." In.: Internet Society.

Shahid, Arsalan, Bilal Khalid, Shahtaj Shaukat, Hashim Ali, and Muhammad Yasir Qadri. 2018. "Internet of Things Shaping Smart Cities: A Survey." In *Internet of Things and Big Data Analytics Toward Next-Generation Intelligence*, 335-58.

Shilpi, and Mohd Ahad. 2020. "Blockchain Technology and Smart Cities - A Review." *EAI Endorsed Transactions on Smart Cities* 4 (10). doi: 10.4108/eai.13-7-2018.163846.

Teeluck, R., S. Durjan, and V. Bassoo. 2021. "Blockchain Technology and Emerging Communications Applications." In *Security and Privacy Applications for Smart City Development*, 207-56.

Tsague, Hippolyte Djonon, and Bheki Twala. 2018. "Practical Techniques for Securing the Internet of Things (IoT) Against Side Channel Attacks." In *Internet of Things and Big*

Data Analytics Toward Next-Generation Intelligence, 439-81.

Smart Water Systems

Abdelhafidh, Maroua, Mohamed Fourati, and Lamia Chaari Fourati. 2020. "A genetic algorithm-based intelligent solution for water pipeline monitoring system in a transient state." *Concurrency and Computation: Practice and Experience*. doi: 10.1002/cpe.5959.

Alabi, Micheal O, Arnesh Telukdarie, Nickey Van, and Janse Rensburg. 2019. Industry 4.0: Innovative Solutions for The Water Industry.

Allen, Michael, Ami Preis, Mudasser Iqbal, and Andrew J. Whittle. 2012. "Case study: a smart water grid in Singapore." *Water Practice and Technology* 7 (4). doi: 10.2166/wpt.2012.089.

Anjana, S., M. N. Sahana, S. Ankith, K. Natarajan, K. R. Shobha, and A. Paventhan. 2015. "An IoT based 6LoWPAN enabled Experiment for Water Management." *IEEE ANTS*.

Bagloee, Saeed Asadi, Mitra Heshmati, Hussein Dia, Hadi Ghaderi, Chris Pettit, and Mohsen Asadi. 2021. "Blockchain: The operating system of smart cities." *Cities* 112. doi: 10.1016/j.cities.2021.103104.

Caragliu, Andrea, Chiara del Bo, and Peter Nijkamp. 2011. "Smart cities in Europe." *Journal of Urban Technology* 18 (2):65-82. doi: 10.1080/10630732.2011.601117.

Chourabi, Hafedh, Taewoo Nam, Shawn Walker, J Ramon Gil-Garcia, Sehl Mellouli, Karine Nahon, Theresa A Pardo, and Hans Jochen Scholl. 2012. Understanding smart cities: An integrative framework. Paper presented at the 45th Hawaii International Conference on System Sciences, Maui, HI.

D'Amico, Gaspare, Raffaella Taddeo, Lei Shi, Tan Yigitcanlar, and Giuseppe Ioppolo. 2020. "Ecological indicators of smart urban metabolism: A review of the literature on international standards." *Ecological Indicators* 118. doi: 10.1016/j.ecolind.2020.106808.

Dogo, Eustace M, Abdulazeez F Salami, Nnamdi I Nwulu, and Clinton O Aigbavboa. 2019. "Blockchain and Internet of Things-Based Technologies for Intelligent Water Management System." In *Artificial Intelligence in IoT*, edited by Fadi Al-Turjman, 129-50. Cham: Springer International Publishing.

Eggimann, Sven, Lena Mutzner, Omar Wani, Mariane Yvonne Schneider, Dorothee Spuhler, Matthew Moy De Vitry, Philipp Beutler, and Max Maurer. 2017. "The Potential of Knowing More: A Review of Data-Driven Urban Water Management." *Environmental Science & Technology* 51 (5):2538-53. doi: 10.1021/acs.est.6b04267.

Lee, Seung Won, Sarper Sarp, Dong Jin Jeon, and Joon Ha Kim. 2014. "Smart water grid: the future water management platform." *Desalination and Water Treatment* 55 (2):339-46. doi: 10.1080/19443994.2014.917887.

Li, Huimin, Xinyao Chen, Zhiwei Guo, Junli Xu, Yu Shen, and Xu Gao. 2021. "Data-driven peer-to-peer blockchain framework for water consumption management." *Peer-to-Peer Networking and Applications*. doi: 10.1007/s12083-021-01121-6.

Li, Jiada, Xiafei Yang, and Robert Sitzenfrei. 2020. "Rethinking the Framework of Smart Water System: A Review." *Water* 12 (2). doi: 10.3390/w12020412.

Lin, Yu-Pin, Joy Petway, Wan-Yu Lien, and Josef Settele. 2018. "Blockchain with Artificial Intelligence to Efficiently Manage Water Use under Climate Change." *Environments* 5 (3):1-2. doi: 10.3390/environments5030034.

Mutchek, Michele, and Eric Williams. 2014. "Moving Towards Sustainable and Resilient Smart

Water Grids." In, 123-37. MDPI AG.
Napolitano, Rebecca, Wesley Reinhart, and Juan Pablo Gevaudan. 2021. "Smart cities built with smart materials." *Science* 371 (6535):1200-1. doi: 10.1126/science.abg4254.
Pahonțu, Bogdan, Diana Arsene, Alexandru Predescu, and Mariana Mocanu. 2020. "Application and challenges of Blockchain technology for real-time operation in a water distribution system." In *24th International Conference on System Theory, Control and Computing*.
Perumal, Thinagaran, Md Nasir Sulaiman, and C. Y. Leong. 2016. Internet of Things (IoT) enabled water monitoring system. Paper presented at the 2015 IEEE 4th Global Conference on Consumer Electronics, 2.
Public Utilities Board Singapore. 2016. "Managing the water distribution network with a Smart Water Grid." *Smart Water* 1 (4):4. doi: 10.1186/s40713-016-0004-4.
Robles, Tomás , Ramón Alcarria, Diego Martín, Mariano Navarro, Rodrigo Calero, Sofía Iglesias, and Manuel López. 2015. "An IoT based reference architecture for smart water management processes." *Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications* 6 (1):4-23. doi: 10.22667/JOWUA.2015.03.31.004.
Rojek, Izabela, and Jan Studzinski. 2019. "Detection and Localization of Water Leaks in Water Nets Supported by an ICT System with Artificial Intelligence Methods as a Way Forward for Smart Cities." *Sustainability* 11 (2):518. doi: 10.3390/su11020518.
Sriyono, Edy. 2020. "Digitizing water management: Toward the innovative use of blockchain technologies to address sustainability." *Cogent Engineering* 7 (1). doi: 10.1080/23311916.2020.1769366.
Syed, Abbas Shah, Daniel Sierra-Sosa, Anup Kumar, and Adel Elmaghraby. 2021. "IoT in Smart Cities: A Survey of Technologies, Practices and Challenges." *Smart Cities* 4 (2):429-75. doi: 10.3390/smartcities4020024.
Tadokoro, Hideyuki, Makoto Onishi, Koji Kageyama, Hiromitsu Kurisu, and Shinsuke Takahashi. 2011. "Smart Water Management and Usage Systems for Society and Environment." In *Hitachi Review*, 164-71.
Wadekar, Sayali , Vinayak Vakare, Ramratan Prajapati, Shivam Yadav, and Vijaypal Yadav. 2016. "Smart Water Management Using IOT." *IEEE Access*.
Xiang, Xiaojun, Qiong Li, Shahnawaz Khan, and Osamah Ibrahim Khalaf. 2021. "Urban water resource management for sustainable environment planning using artificial intelligence techniques." *Environmental Impact Assessment Review* 86. doi: 10.1016/j.eiar.2020.106515.
Yang, Ji, Yong Li, Nan Feng Zhang, Jing Feng Yang, Ke Kuang, Yue Hua Hu, and Wen Guang Qi. 2015. "Analysis of Urban Residential Water Consumption Based on Smart Meters and Fuzzy Clustering." In *2015 IEEE International Conference on Computer and Information Technology; Ubiquitous Computing and Communications; Dependable, Autonomic and Secure Computing; Pervasive Intelligence and Computing*, 1295-301.

Water Quality Monitoring

AlMetwally, Saif Allah H., Mohamed K. Hassan, and Mohamed H. Mourad. 2020. "Real Time Internet of Things (IoT) Based Water Quality Management System." *Procedia CIRP* 91:478-85. doi: 10.1016/j.procir.2020.03.107.
Arvind, Arnav , Rajtirtha Paul, and Paurush Bhulania. 2020. "Implementation of Water Quality Sensing System using Internet of Things." In.

Bahadori, Alireza, and Scott T. Smith. 2016. *Dictionary of Environmental Engineering and Wastewater Treatment*: Springer, Cham.

Bai, Qiuchan, Jiahao Wu, and Chunxia Jin. 2020. "The Water Quality Online Monitoring System Based on Wireless Sensor Network." In *2020 13th International Symposium on Computational Intelligence and Design (ISCID)*, 234-7.

Chowdury, Mohammad Salah Uddin, Talha Bin Emran, Subhasish Ghosh, Abhijit Pathak, Mohd Manjur Alam, Nurul Absar, Karl Andersson, and Mohammad Shahadat Hossain. 2019. "IoT Based Real-time River Water Quality Monitoring System." *Procedia Computer Science* 155:161-8. doi: 10.1016/j.procs.2019.08.025.

Cianchi, P., S. Marsili-Libelli, A Burchi, and S Burchielli. 2000. "Integrated river quality management using internet technologies." In *WATERMATEX*. Gent, Belgium.

Das, Brinda, and P.C. Jain. 2017. "Real-Time Water Quality Monitoring System using Internet of Things." In *International Conference on Computer, Communications and Electronics (Comptelix)*, 78-82. Jaipur, Malaviya.

Dogo, Eustace M., Nnamdi I. Nwulu, Bhekisipho Twala, and Clinton Aigbavboa. 2019. "A survey of machine learning methods applied to anomaly detection on drinking-water quality data." *Urban Water Journal* 16 (3):235-48. doi: 10.1080/1573062x.2019.1637002.

Geetha, S., and S. Gouthami. 2016. "Internet of things enabled real time water quality monitoring system." In.: Springer Science and Business Media LLC.

Glasgow, Howard B., Joann M. Burkholder, Robert E. Reed, Alan J. Lewitus, and Joseph E. Kleinman. 2004. "Real-time remote monitoring of water quality: a review of current applications, and advancements in sensor, telemetry, and computing technologies." *Journal of Experimental Marine Biology and Ecology* 300 (1-2):409-48. doi: 10.1016/j.jembe.2004.02.022.

Hoos, Anne B., Sherry H. Wang, and Gregory E. Schwarz. 2019. "Adapting a regional water-quality model for local application: A case study for Tennessee, USA." *Environmental Modelling & Software* 115:187-99. doi: 10.1016/j.envsoft.2019.01.001.

Ighalo, Joshua O., and Adewale G. Adeniyi. 2020. "A comprehensive review of water quality monitoring and assessment in Nigeria." *Chemosphere* 260:127569. doi: 10.1016/j.chemosphere.2020.127569.

Ighalo, Joshua O., Adewale George Adeniyi, and Goncalo Marques. 2021. "Internet of Things for Water Quality Monitoring and Assessment: A Comprehensive Review." In *Artificial Intelligence for Sustainable Development: Theory, Practice and Future Applications*, 245-59.

Kamaludin, Kamarul Hafiz, and Widad Ismail. 2017. "Water Quality Monitoring with Internet of Things (IoT)." In *IEEE Conference on Systems, Process and Control (ICSPC 2017)*, 18-23. Melaka, Malaysia.

Kumar, D. Senthil , A. Askarunisa, and R. Mohan Kumar. 2020. "Embedded processor based automated assessment of quality of the water in an IoT background." *Microprocessors and Microsystems* 77:103167. doi: 10.1016/j.micpro.2020.103167.

Kumar Jha, Manish, Rajni Kumari Sah, Rashmitha M. S., Rupam Sinha, Sujatha B., and Suma K. V. 2018. Smart Water Monitoring System for Real-time water quality and usage monitoring. Paper presented at the International Conference on Inventive Research in Computing Applications.

Lavanya, N., and T. M. Raghavendra Babu. 2019. "A Survey on Smart Water Quality

Monitoring System based on IoT." *International Journal of Research in Engineering, Science and Management* 2 (4):153-6.
Meshal, Ahmed, Michael N Mikhael, and Hala A Mansour. 2020. "Water Quality Monitoring system of the Nile River." *ENGINEERING RESEARCH JOURNAL (ERJ)* 1 (43):100-4.
Nie, Xiangtian, Tianyu Fan, Bo Wang, Zhiyong Li, Achyut Shankar, and Adhiyaman Manickam. 2020. "Big Data analytics and IoT in Operation safety management in Under Water Management." *Computer Communications* 154:188-96. doi: 10.1016/j.comcom.2020.02.052.
Rodriguez-Perez, J., C. Leigh, B. Liquet, C. Kermorvant, E. Peterson, D. Sous, and K. Mengersen. 2020. "Detecting Technical Anomalies in High-Frequency Water-Quality Data Using Artificial Neural Networks." *Environ Sci Technol*. doi: 10.1021/acs.est.0c04069.
Saravanan, K., E. Anusuya, R. Kumar, and L. H. Son. 2018. "Real-time water quality monitoring using Internet of Things in SCADA." *Environ Monit Assess* 190 (9):556. doi: 10.1007/s10661-018-6914-x.
Sarraf, Rajan, Shalini Ojha, Damini Biraris, and Kishor B Bhangale. 2020. "IoT Based Smart Quality Water Management System." *INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH AND ENGINEERING TRENDS* 5 (3):12-6.
Shanthi, S, T Gopi, and C Vidhyesh. 2019. "IoT Based Water and Air Quality Monitoring System and Analysis." *International Journal of Applied Engineering Research* 14 (6):1405-9.
Sithole, Mhambi Phila Philadephian, Nnamdi I. Nwulu, and Eustace M. Dogo. 2019. "Dataset for a wireless sensor network based drinking-water quality monitoring and notification system." *Data in brief* 27. doi: 10.1016/j.dib.2019.104813.
Sithole, M.P.P., N. I. Nwulu, and E. M. Dogo. 2019. Development of a Wireless Sensor Network Based Water Quality Monitoring and Notification System. Paper presented at the 2019 International Artificial Intelligence and Data Processing Symposium (IDAP), Malatya, Turkey, 21-22 Sept.
Spandana, K. , and V.R. Seshagiri Rao. 2018. "Internet of Things (Iot) Based Smart Water Quality Monitoring System."
Tripathy, Asis Kumar, Tapan Kumar Das, and Chiranji Lal Chowdhary. 2020. "Monitoring Quality of Tap Water in Cities Using IoT." In *Emerging Technologies for Agriculture and Environment*, edited by Babu Subramanian, Shiao-Shing Chen and Krishna R. Reddy, 107-13. Springer Singapore.
Wang, Shumei, Zhaoji Zhang, Zhilong Ye, Xiaojun Wang, Xiangyu Lin, and Shaohua Chen. 2013. "Application of Environmental Internet of Things on water quality management of urban scenic river." *International Journal of Sustainable Development & World Ecology* 20 (3):216-22. doi: 10.1080/13504509.2013.785040.
Wiliem, L., Prasad K. D. V. Yarlagadda, and Shouqin Zhou. 2006. Development of Internet Based Real-Time Water Condition Monitoring System. Paper presented at the 19th International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering Management (COMADEM 2006), Lulea, Sweden.
Wu, Di, Hao Wang, and Razak Seidu. 2020. "Smart data driven quality prediction for urban water source management." *Future Generation Computer Systems* 107:418-32. doi: 10.1016/j.future.2020.02.022.
Zin, M. Cho, G. Lenin, L. Huo Chong, and M. V. Prassana. 2019. "Real-time water quality

system in internet of things." In.: Institute of Physics Publishing.

Storm Water Management

Bassi, Andrea, Andrés Cuéllar, Georg Pallaske, and Laurin Wuennenberg. 2017. "Stormwater Markets: Concepts and applications." In.: International Institute for Sustainable Development.

Guan, Mingfu, Qiuhua Liang, and Jingming Hou. 2021. "Editorial: Smart Approaches to Predict Urban Flooding: Current Advances and Challenges." *Frontiers in Earth Science* 9. doi: 10.3389/feart.2021.681751.

Kabir, Syed, Sandhya Patidar, Xilin Xia, Qiuhua Liang, Jeffrey Neal, and Gareth Pender. 2020. "A deep convolutional neural network model for rapid prediction of fluvial flood inundation." *Journal of Hydrology* 590. doi: 10.1016/j.jhydrol.2020.125481.

Lathrop, Richard G., Lisa Auermuller, Scott Haag, and Wansoo Im. 2012. "The StormWater Management and Planning Tool: Coastal Water Quality Enhancement through the Use of an Internet-Based Geospatial Tool." *Coastal Management* 40 (4):339-54. doi: 10.1080/08920753.2012.692309.

Le Jallé, Christophe, Denis Désille, and Gilles Burkhardt. 2013. "Urban stormwater management in developing countries." *NOVATECH*.

McPhillips, Lauren E., and A. Marissa Matsler. 2018. "Temporal Evolution of Green Stormwater Infrastructure Strategies in Three US Cities." *Frontiers in Built Environment* 4. doi: 10.3389/fbuil.2018.00026.

Nie, Xiangtian, Tianyu Fan, Bo Wang, Zhiyong Li, Achyut Shankar, and Adhiyaman Manickam. 2020. "Big Data analytics and IoT in Operation safety management in Under Water Management." *Computer Communications* 154:188-96. doi: 10.1016/j.comcom.2020.02.052.

Su, Xiaodan, Guofan Shao, Jonathan Vause, and Lina Tang. 2013. "An integrated system for urban environmental monitoring and management based on the Environmental Internet of Things." *International Journal of Sustainable Development & World Ecology* 20 (3):205-9. doi: 10.1080/13504509.2013.782580.

Yazdi, M. N., D. J. Sample, D. Scott, J. S. Owen, M. Ketabchy, and N. Alamdari. 2019. "Water quality characterization of storm and irrigation runoff from a container nursery." *Sci Total Environ* 667:166-78. doi: 10.1016/j.scitotenv.2019.02.326.

Excluded References

Akyildiz, Ian F., Dario Pompili, and Tommaso Melodia. 2005. "Underwater acoustic sensor networks: research challenges." *Ad Hoc Networks* 3 (3):257-79. doi: 10.1016/j.adhoc.2005.01.004.

Antonucci, F., S. Figorilli, C. Costa, F. Pallottino, L. Raso, and P. Menesatti. 2019. "A review on blockchain applications in the agri-food sector." *J Sci Food Agric* 99 (14):6129-38. doi: 10.1002/jsfa.9912.

Attia, A. M., A. M. Ghaithan, and S. O. Duffuaa. 2019. "Data on upstream segment of a hydrocarbon supply chain in Saudi Arabia." *Data Brief* 27:104804. doi: 10.1016/j.dib.2019.104804.

Awan, Khalid Mahmood, Peer Azmat Shah, Khalid Iqbal, Saira Gillani, Waqas Ahmad, and

Yunyoung Nam. 2019. "Underwater Wireless Sensor Networks: A Review of Recent Issues and Challenges." *Wireless Communications and Mobile Computing* 2019:1-20. doi: 10.1155/2019/6470359.

Bermeo-Almeida, Oscar, Mario Cardenas-Rodriguez, Teresa Samaniego-Cobo, Enrique Ferruzola-Gómez, Roberto Cabezas-Cabezas, and William Bazán-Vera. 2018. "Blockchain in Agriculture: A Systematic Literature Review." In *Technologies and Innovation*, 44-56. Springer International Publishing.

Betancourt, Walter , Ian Pepper, and Charles Gerba. 2020. "Sewage Surveillance For Coronavirus-University of Arizona West Center Analysis Fact Sheet." In *West Center Analysis Fact Sheet*. University of Arizona.

Birner, Regina, Thomas Daum, and Carl Pray. 2021. "Who drives the digital revolution in agriculture? A review of supply-side trends, players and challenges." *Applied Economic Perspectives and Policy*. doi: 10.1002/aepp.13145.

Bordel, B. , D. Martin, R. Alcarria, and T. Robles. 2019. A Blockchain-based Water Control System for the Automatic Management of Irrigation Communities. Paper presented at the 2019 IEEE International Conference on Consumer Electronics (ICCE), 11-13 January.

Casey, Kenan, Alvin Lim, and Gerry Dozier. 2008. "A Sensor Network Architecture for Tsunami Detection and Response." *International Journal of Distributed Sensor Networks* 4 (1):27-42. doi: 10.1080/15501320701774675.

Cayirci, Erdal, Hakan Tezcan, Yasar Dogan, and Vedat Coskun. 2006. "Wireless sensor networks for underwater survelliance systems." *Ad Hoc Networks* 4 (4):431-46. doi: 10.1016/j.adhoc.2004.10.008.

Chen, Yiheng, and Dawei Han. 2018. "Water quality monitoring in smart city: A pilot project." *Automation in Construction* 89:307-16. doi: 10.1016/j.autcon.2018.02.008.

Cloete, Niel Andre, Reza Malekian, and Lakshmi Nair. 2016. "Design of Smart Sensors for Real-Time Water Quality Monitoring." *IEEE Access* 4:3975-90. doi: 10.1109/access.2016.2592958.

Collart, Alba J., and Elizabeth Canales. 2021. "How might broad adoption of blockchain-based traceability impact the U.S. fresh produce supply chain?" *Applied Economic Perspectives and Policy*. doi: 10.1002/aepp.13134.

Coraggio, Elisa, Dawei Han, Weiru Liu, Theo Tryfonas. 2019. Hydroinformatics of Smart Cities: Real-Time Water Quality Monitoring and Prediction. Paper presented at the 38th IAHR World Congress, Panama City, Panama, September 1-6.

Cousin, Elissa, and Emmanuelle Taugourdeau. 2016. "Cost minimizing water main quality index: A static cost minimization approach." *Water Resources and Economics* 15:28-42. doi: 10.1016/j.wre.2016.06.001.

Creydt, M., and M. Fischer. 2019. "Blockchain and more - Algorithm driven food traceability." *Food Control* 105:45-51. doi: 10.1016/j.foodcont.2019.05.019.

Darehshoorzadeh, Amir, and Azzedine Boukerche. 2015. "Underwater sensor networks: a new challenge for opportunistic routing protocols." *IEEE Communications Magazine* 53 (11):98-107. doi: 10.1109/mcom.2015.7321977.

Das, Barun K., Najmul Hoque, Soumya Mandal, Tapas Kumar Pal, and Md Abu Raihan. 2017. "A techno-economic feasibility of a stand-alone hybrid power generation for remote area application in Bangladesh." *Energy* 134:775-88. doi: 10.1016/j.energy.2017.06.024.

Davis, A., and Chang Hwa. 2012. "Underwater wireless sensor networks." In *2012 Oceans*, 1-5.

Dogo, Eustace M., Abdulazeez Femi Salami, and S.I. Salman. 2013. "Feasibility Analysis of

Critical Factors Affecting Cloud Computing in Nigeria." *International Journal of Cloud Computing and Services Science* 2 (4):276-87.
Domingo, Mari Carmen. 2012. "An overview of the internet of underwater things." *Journal of Network and Computer Applications* 35 (6):1879-90. doi: 10.1016/j.jnca.2012.07.012.
Domingo, Mari Carmen, and Rui Prior. 2008. "Energy analysis of routing protocols for underwater wireless sensor networks." *Computer Communications* 31 (6):1227-38. doi: 10.1016/j.comcom.2007.11.005.
Dursun, Taner, and Burak Berk Üstündağ. 2021. "A novel framework for policy based on-chain governance of blockchain networks." *Information Processing & Management* 58 (4):102556. doi: 10.1016/j.ipm.2021.102556.
Eldien, Hany Hossam, Karim Gazzeh, Emad Hammad. 2020. "Sustainable supply chain management in smart city design: A case study of Al Khobar City centre." *Int. J Sup. Chain. Mgt* 9 (4).
Esakki, B., S. Ganesan, S. Mathiyazhagan, K. Ramasubramanian, B. Gnanasekaran, B. Son, S. W. Park, and J. S. Choi. 2018. "Design of Amphibious Vehicle for Unmanned Mission in Water Quality Monitoring Using Internet of Things." *Sensors (Basel)* 18 (10). doi: 10.3390/s18103318.
Fazelpour, Farivar, Nima Soltani, and Marc A. Rosen. 2016. "Economic analysis of standalone hybrid energy systems for application in Tehran, Iran." *International Journal of Hydrogen Energy* 41 (19):7732-43. doi: 10.1016/j.ijhydene.2016.01.113.
Felemban, Emad, Faisal Karim Shaikh, Umair Mujtaba Qureshi, Adil A. Sheikh, and Saad Bin Qaisar. 2015. "Underwater Sensor Network Applications: A Comprehensive Survey." *International Journal of Distributed Sensor Networks* 11 (11). doi: 10.1155/2015/896832.
Gray, Wayne B., and Jay P. Shimshack. 2011. "The Effectiveness of Environmental Monitoring and Enforcement: A Review of the Empirical Evidence." *Review of Environmental Economics and Policy* 5 (1):3-24. doi: 10.1093/reep/req017.
Griffin, Terry W., Keith D. Harris, Jason K. Ward, Paul Goeringer, and Jessica A. Richard. 2021. "Three Digital Agriculture Problems in Cotton Solved by Distributed Ledger Technology." *Applied Economic Perspectives and Policy*. doi: 10.1002/aepp.13142.
Guan, Quansheng, Fei Ji, Yun Liu, Hua Yu, and Weiqi Chen. 2019. "Distance-Vector-Based Opportunistic Routing for Underwater Acoustic Sensor Networks." *IEEE Internet of Things Journal* 6 (2):3831-9. doi: 10.1109/jiot.2019.2891910.
Guo, Ying, and Yutao Liu. 2013. "Localization for anchor-free underwater sensor networks." *Computers & Electrical Engineering* 39 (6):1812-21. doi: 10.1016/j.compeleceng.2013.02.001.
Han, Guangjie , Jinfang Jiang, Na Bao, Liangtian Wan, and Mohsen Guizani. 2015. "Routing Protocols for Underwater Wireless Sensor Networks."
Han, Guangjie, Aihua Qian, Chenyu Zhang, Yan Wang, and Joel J. P. C. Rodrigues. 2014. "Localization Algorithms in Large-Scale Underwater Acoustic Sensor Networks: A Quantitative Comparison." *International Journal of Distributed Sensor Networks* 10 (3). doi: 10.1155/2014/379382.
Heidemann, J., M. Stojanovic, and M. Zorzi. 2012. "Underwater sensor networks: applications, advances and challenges." *Philos Trans A Math Phys Eng Sci* 370 (1958):158-75. doi: 10.1098/rsta.2011.0214.
Hollinger, Geoffrey A., Sunav Choudhary, Parastoo Qarabaqi, Christopher Murphy, Urbashi Mitra, Gaurav S. Sukhatme, Milica Stojanovic, Hanumant Singh, and Franz Hover. 2012.

"Underwater Data Collection Using Robotic Sensor Networks." *IEEE Journal on Selected Areas in Communications* 30 (5):899-911. doi: 10.1109/jsac.2012.120606.
Hoover, Joseph H., Paul C. Sutton, Sharolyn J. Anderson, and Arturo C. Keller. 2014. "Designing and evaluating a groundwater quality Internet GIS." *Applied Geography* 53:55-65. doi: 10.1016/j.apgeog.2014.06.005.
Huang, Yan, Wei Liang, Hai-bin Yu, and Yang Xiao. 2008. "Target tracking based on a distributed particle filter in underwater sensor networks." *Wireless Communications and Mobile Computing* 8 (8):1023-33. doi: 10.1002/wcm.660.
Hussaini, M, H Bello-Salau, A F Salami, F Anwar, A H Abdalla, Rafiqul Islam. 2012. "Enhanced Clustering Routing Protocol for Power-Efficient Gathering in Wireless Sensor Network." *International Journal of Communication Networks and Information Security (IJCNIS)* 4.
Hwang, Daeyoup , and Dongkyun Kim. 2008. DFR: Directional Flooding-Based Routing Protocol for Underwater Sensor Networks. Paper presented at the OCEANS 2008, Quebec City, QC, Canada.
Jankowski, Piotr, Ming-Hsiang Tsou, and Richard D. Wright. 2007. "Applying Internet Geographic Information System for Water Quality Monitoring." *Geography Compass* 1 (6):1315-37. doi: 10.1111/j.1749-8198.2007.00065.x.
Kamilaris, Andreas, Ian R. Cole, and Francesc X. Prenafeta-Boldú. 2021. "Blockchain in agriculture." In *Food Technology Disruptions*, edited by Charis M. Galanakis, 247-84. Elsevier.
Kamilaris, Andreas, Agusti Fonts, and Francesc X. Prenafeta-Boldú. 2019. "The rise of blockchain technology in agriculture and food supply chains." *Trends in Food Science & Technology* 91:640-52. doi: 10.1016/j.tifs.2019.07.034.
Kao, C. C., Y. S. Lin, G. D. Wu, and C. J. Huang. 2017. "A Comprehensive Study on the Internet of Underwater Things: Applications, Challenges, and Channel Models." *Sensors (Basel)* 17 (7). doi: 10.3390/s17071477.
Kemna, Stephanie, Michael J. Hamilton, David T. Hughes, and Kevin D. LePage. 2011. "Adaptive autonomous underwater vehicles for littoral surveillance." *Intelligent Service Robotics* 4 (4):245-58. doi: 10.1007/s11370-011-0097-4.
Khan, Arijit, and Lawrence Jenkins. 2008. "Undersea wireless sensor network for ocean pollution prevention." In *2008 3rd International Conference on Communication Systems Software and Middleware and Workshops (COMSWARE '08)*, 2-8.
Khanna, Madhu. 2020. "Digital Transformation of the Agricultural Sector: Pathways, Drivers and Policy Implications." *Applied Economic Perspectives and Policy*. doi: 10.1002/aepp.13103.
Kouhizadeh, Mahtab, and Joseph Sarkis. 2018. "Blockchain Practices, Potentials, and Perspectives in Greening Supply Chains." *Sustainability* 10 (10). doi: 10.3390/su10103652.
Kour, Vippon Preet, and Sakshi Arora. 2020. "Recent Developments of the Internet of Things in Agriculture: A Survey." *IEEE Access* 8:129924-57. doi: 10.1109/access.2020.3009298.
Krishnamraju, P., S. Shahabas, S. S. Asadi. 2017. "Preparation of model urban action plan for effective environmental management: A case study from A.P." *International Journal of Civil Engineering and Technology (IJCIET)*.
Krzyzanowski Guerra, Kathleen, and Kathryn A. Boys. 2021. "A new food chain: Adoption and policy implications to blockchain use in agri-food industries." *Applied Economic*

Perspectives and Policy. doi: 10.1002/aepp.13163.
Kumar, Prashant , Preetam Kumar, Poonam Priyadarshini, and Srija. 2012. Underwater Acoustic Sensor Network for Early Warning Generation. Paper presented at the 2012 Oceans, 14-19 Oct.
Lakkakula, Prithviraj, David W. Bullock, and William W. Wilson. 2021. "Asymmetric information and blockchains in soybean commodity markets." *Applied Economic Perspectives and Policy*. doi: 10.1002/aepp.13159.
Lakshmiprabha, Kakkanallur Ethirajan, and Chinnathambi Govindaraju. 2019. "Hydroponic-based smart irrigation system using Internet of Things." *International Journal of Communication Systems*. doi: 10.1002/dac.4071.
Le Sève, Miriam Denis, Nathaniel Mason, and Darius Nassiry. 2018. "Delivering blockchain's potential for environmental sustainability." In.: Overseas Development Institute.
Lin, Wen, David L. Ortega, Danielle Ufer, Vincenzina Caputo, and Titus Awokuse. 2020. "Blockchain-based traceability and demand for U.S. beef in China." *Applied Economic Perspectives and Policy*. doi: 10.1002/aepp.13135.
Liu, Ping, Jin Wang, Arun Sangaiah, Yang Xie, and Xinchun Yin. 2019. "Analysis and Prediction of Water Quality Using LSTM Deep Neural Networks in IoT Environment." *Sustainability* 11 (7):2058. doi: 10.3390/su11072058.
Lloret, J. 2013. "Underwater sensor nodes and networks." *Sensors (Basel)* 13 (9):11782-96. doi: 10.3390/s130911782.
Lloret, Jaime, Sandra Sendra, Miguel Garcia, and Gines Lloret. 2011. "Group-based underwater wireless sensor network for marine fish farms." In *2011 IEEE GLOBECOM Workshops (GC Wkshps)*, 115-9.
Mahalakshmi, J., K. Kuppusamy, C. Kaleeswari, and P. Maheswari. 2020. "IoT Sensor-Based Smart Agricultural System." In *Emerging Technologies for Agriculture and Environment*, edited by Babu Subramanian, Shiao-Shing Chen and Krishna R. Reddy, 39-52. Springer Singapore.
Mahmoudzadeh, S., D. M. W. Powers, and A. Atyabi. 2019. "UUV's Hierarchical DE-Based Motion Planning in a Semi Dynamic Underwater Wireless Sensor Network." *IEEE Trans Cybern* 49 (8):2992-3005. doi: 10.1109/TCYB.2018.2837134.
Maksimovic, M. 2018. "Greening the Future: Green Internet of Things (G-IoT) as a Key Technological Enabler of Sustainable Development." In *Internet of Things and Big Data Analytics Toward Next-Generation Intelligence*, 283-313.
Mallapaty, Smriti 2020. "How Sewage Could Reveal True Scale of Coronavirus Outbreak." *Nature* 580 (7802):176-7.
Marques, Gonçalo, Diogo Aleixo, and Rui Pitarma. 2019. "Enhanced Hydroponic Agriculture Environmental Monitoring: An Internet of Things Approach." In *Computational Science – ICCS 2019*, 658-69. Springer International Publishing.
Martyusheva, Olga. 2014. "Smart Water Grid." Colorado State University.
Maucieri, Carmelo, Carlo Nicoletto, Ranka Junge, Zala Schmautz, Paolo Sambo, and Maurizio Borin. 2017. "Hydroponic systems and water management in aquaponics: a review." *Italian Journal of Agronomy* 11:1-11. doi: 10.4081/ija.2017.1012.
McDonald, T. L. 2003. "Review of environmental monitoring methods: survey designs." *Environ Monit Assess* 85 (3):277-92. doi: 10.1023/a:1023954311636.
Mehra, Manav, Sameer Saxena, Suresh Sankaranarayanan, Rijo Jackson Tom, and M. Veeramanikandan. 2018. "IoT based hydroponics system using Deep Neural Networks."

Computers and Electronics in Agriculture 155:473-86. doi: 10.1016/j.compag.2018.10.015.
Mohammadi, Kasra, Mahmoud Naderi, and Mohammad Saghafifar. 2018. "Economic feasibility of developing grid-connected photovoltaic plants in the southern coast of Iran." *Energy* 156:17-31. doi: 10.1016/j.energy.2018.05.065.
Moher, D., A. Liberati, J. Tetzlaff, D. G. Altman, and Prisma Group. 2009. "Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement." *PLoS Med* 6 (7):e1000097. doi: 10.1371/journal.pmed.1000097.
Moldaenke, C., Y. Fang, F. Yang, and A. Dahlhaus. 2019. "Early warning method for cyanobacteria toxin, taste and odor problems by the evaluation of fluorescence signals." *Sci Total Environ* 667:681-90. doi: 10.1016/j.scitotenv.2019.02.271.
Motta, Giorgio Alessandro, Bedir Tekinerdogan, and Ioannis N. Athanasiadis. 2020. "Blockchain Applications in the Agri-Food Domain: The First Wave." *Frontiers in Blockchain* 3. doi: 10.3389/fbloc.2020.00006.
Msimango, Langalibalele Innocent. 2018. "A critical evaluation of urban water management: Comparative Case Studies of Meadowlands Township, Soweto and Florida Suburb, Roodepoort." University of South Africa.
Ntuli, Nonhlanhla, and Adnan Abu-Mahfouz. 2016. "A Simple Security Architecture for Smart Water Management System." *Procedia Computer Science* 83:1164-9. doi: 10.1016/j.procs.2016.04.239.
Palande, Vaibhav, Adam Zaheer, and Kiran George. 2018. "Fully Automated Hydroponic System for Indoor Plant Growth." *Procedia Computer Science* 129:482-8. doi: 10.1016/j.procs.2018.03.028.
Parra, L., S. Sendra, J. Lloret, and I. Bosch. 2015. "Development of a Conductivity Sensor for Monitoring Groundwater Resources to Optimize Water Management in Smart City Environments." *Sensors (Basel)* 15 (9):20990-1015. doi: 10.3390/s150920990.
Peiser, Jaclyn. 2020. "The University of Arizona says it caught a dorm's covid-19 outbreak before it started. Its secret weapon: Poop." In. The Washington Post.
Petrioli, Chiara, Roberto Petroccia, John R. Potter, and Daniele Spaccini. 2015. "The SUNSET framework for simulation, emulation and at-sea testing of underwater wireless sensor networks." *Ad Hoc Networks* 34:224-38. doi: 10.1016/j.adhoc.2014.08.012.
Pirisi, A., F. Grimaccia, M. Mussetta, R.E. Zich, R. Johnstone, M. Palaniswami, and S. Rajasegarar. 2013. Optimization of an Energy Harvesting Buoy for Coral Reef Monitoring. Paper presented at the 2013 IEEE Congress on Evolutionary Computation, Cancún, México, June 20-23.
Postolache, O., P. Girao, M. Pereira, and H. Ramos. 2002. 55.2: An Internet and Microcontroller-Based Remote Operation Multi-Sensor System for Water Quality Monitoring. Paper presented at the SENSOR, Orlando, FL.
Predescu, Alexandru, Diana Arsene, Bogdan Pahonțu, Mariana Mocanu, and Costin Chiru. 2021. "A Serious Gaming Approach for Crowdsensing in Urban Water Infrastructure with Blockchain Support." *Applied Sciences* 11 (4). doi: 10.3390/app11041449.
Rabadiya Kinjal, A., B. Shivangi Patel, and C. Chintan Bhatt. 2018. "Smart Irrigation: Towards Next Generation Agriculture." In *Internet of Things and Big Data Analytics Toward Next-Generation Intelligence*, 265-82.
Rao, Aravinda S., Stephen Marshall, Jayavardhana Gubbi, Marimuthu Palaniswami, Richard Sinnott, and Vincent Pettigrove. 2013. "Design of Low-cost Autonomous Water Quality

Monitoring System." In *International Conference on Advances in Computing, Communications and Informatics (ICACCI)*, 14-9.
Ribeiro, Victor Henrique Alves, and Gilberto Reynoso-Meza. 2019. "Monitoring of drinking-water quality by means of a multi-objective ensemble learning approach." In *Proceedings of the Genetic and Evolutionary Computation Conference Companion*, 1-2.
Risius, Marten, and Kai Spohrer. 2017. "A Blockchain Research Framework." *Business & Information Systems Engineering* 59 (6):385-409. doi: 10.1007/s12599-017-0506-0.
Rocas-Royo, Marc. 2021. "The Blockchain That Was Not: The Case of Four Cooperative Agroecological Supermarkets." *Frontiers in Blockchain* 4. doi: 10.3389/fbloc.2021.624810.
Ruengittinun, Somchoke, Sitthidech Phongsamsuan, and Phasawut Sureeratanakorn. 2017. Applied Internet of Thing for Smart Hydroponic Farming Ecosystem (HFE). Paper presented at the 10th International Conference on Ubi-media Computing and Workshops, Pattaya, Thailand, 1-4 Aug.
Salami, Abdulazeez Femi, Eustace M. Dogo, Tebogo Makaba, Emmanuel Adewale Adedokun, Muhammed Bashir Muazu, Bashir Olaniyi Sadiq, and Ahmed Tijani Salawudeen. 2020. "A Decade Bibliometric Analysis of Underwater Sensor Network Research on the Internet of Underwater Things: An African Perspective." In *Trends in Cloud-based IoT*, 147-82.
Salunke, Prashant, and Jui Kate. 2017. "Advanced smart sensor interface in internet of things for water quality monitoring." In *2017 International Conference on Data Management, Analytics and Innovation (ICDMAI)*, 298-302. Pune, India.
Shah, Peer Azmat, Muhammad Yousaf, Amir Qayyum, and Halabi B. Hasbullah. 2012. "Performance comparison of end-to-end mobility management protocols for TCP." *Journal of Network and Computer Applications* 35 (6):1657-73. doi: 10.1016/j.jnca.2012.05.002.
Shakir, Mustafa, Mahmood Ashraf Khan, Shahzad A. Malik, and Izhar-ul-Haq. 2012. "Design of Underwater Sensor Networks for Water Quality Monitoring."
Sharma, Ashutosh, Sarishma, Ravi Tomar, Naveen Chilamkurti, and Byung-Gyu Kim. 2020. "Blockchain Based Smart Contracts for Internet of Medical Things in e-Healthcare." *Electronics* 9 (10). doi: 10.3390/electronics9101609.
Shew, Aaron M., Heather A. Snell, Rodolfo M. Nayga, and Mary C. Lacity. 2021. "Consumer valuation of blockchain traceability for beef in the United States." *Applied Economic Perspectives and Policy*. doi: 10.1002/aepp.13157.
Stojanovic, Milica. 2006. "On the relationship between capacity and distance in an underwater acoustic communication channel." 2006:41-7. doi: 10.1145/1161039.1161049.
Sutadian, A. D., N. Muttil, A. G. Yilmaz, and B. J. Perera. 2016. "Development of river water quality indices-a review." *Environ Monit Assess* 188 (1):58. doi: 10.1007/s10661-015-5050-0.
Tan, Bing Qing, Fangfang Wang, Jia Liu, Kai Kang, and Federica Costa. 2020. "A Blockchain-Based Framework for Green Logistics in Supply Chains." *Sustainability* 12 (11). doi: 10.3390/su12114656.
Toran, F, D Ramirez, S Casans, A E Navarro, and J Pelegri. 2000. Distributed Virtual Instrument for Water Quality Monitoring Across the Internet. Paper presented at the 17th IEEE Instrumentation and Measurement Technology Conference, Baltimore, MD, 1-4 May.
Torán, F., D. Ramírez, A. E. Navarro, S. Casans, J. Pelegrí, and J. M. Espí. 2001. "Design of a

virtual instrument for water quality monitoring across the Internet." *Sensors and Actuators B: Chemical* 76 (1-3):281-5. doi: 10.1016/s0925-4005(01)00584-6.

Torres, Marcelo de O., Richard Howitt, and Lineu N. Rodrigues. 2016. "Modeling the economic benefits and distributional impacts of supplemental irrigation." *Water Resources and Economics* 14:1-12. doi: 10.1016/j.wre.2016.03.001.

Vadgama, Nikhil, and Paolo Tasca. 2021. "An Analysis of Blockchain Adoption in Supply Chains Between 2010 and 2020." *Frontiers in Blockchain* 4. doi: 10.3389/fbloc.2021.610476.

Violino, S., F. Pallottino, G. Sperandio, S. Figorilli, F. Antonucci, V. Ioannoni, D. Fappiano, and C. Costa. 2019. "Are the Innovative Electronic Labels for Extra Virgin Olive Oil Sustainable, Traceable, and Accepted by Consumers?" *Foods* 8 (11):529. doi: 10.3390/foods8110529.

Watt, A. J., M. R. Phillips, C. E. Campbell, I. Wells, and S. Hole. 2019. "Wireless Sensor Networks for monitoring underwater sediment transport." *Sci Total Environ* 667:160-5. doi: 10.1016/j.scitotenv.2019.02.369.

Williams, David P. 2010. "On optimal AUV track-spacing for underwater mine detection." In *2010 IEEE International Conference on Robotics and Automation*, 4755-62. Anchorage, Alaska.

Xiong, Hang, Tobias Dalhaus, Puqing Wang, and Jiajin Huang. 2020. "Blockchain Technology for Agriculture: Applications and Rationale." *Frontiers in Blockchain* 3. doi: 10.3389/fbloc.2020.00007.

Xu, G., W. Shen, and X. Wang. 2014. "Applications of wireless sensor networks in marine environment monitoring: a survey." *Sensors (Basel)* 14 (9):16932-54. doi: 10.3390/s140916932.

Yang, Rebecca, Ron Wakefield, Sainan Lyu, Sajani Jayasuriya, Fengling Han, Xun Yi, Xuechao Yang, Gayashan Amarasinghe, and Shiping Chen. 2020. "Public and private blockchain in construction business process and information integration." *Automation in Construction* 118. doi: 10.1016/j.autcon.2020.103276.

Yu, X., Y. Li, X. Gu, J. Bao, H. Yang, and L. Sun. 2014. "Laser-induced breakdown spectroscopy application in environmental monitoring of water quality: a review." *Environ Monit Assess* 186 (12):8969-80. doi: 10.1007/s10661-014-4058-1.

Yuan, Z., G. Olsson, R. Cardell-Oliver, K. van Schagen, A. Marchi, A. Deletic, C. Urich, W. Rauch, Y. Liu, and G. Jiang. 2019. "Sweating the assets - The role of instrumentation, control and automation in urban water systems." *Water Res* 155:381-402. doi: 10.1016/j.watres.2019.02.034.