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**South Asian Perspective on Water and Energy
Demand; Will It be a Resilient Future?**

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REVIEW BASED BOOK CHAPTER**South Asian Perspective on Water and Energy Demand; Will It be a Resilient Future?**

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Abstract

This chapter provides an overview of the water and energy demand, challenges, and prospects in South Asia. The region faces significant challenges in managing its water and energy demand, exacerbated by climate change. The report examines the water resources in the region, including the rivers and groundwater, and the various uses of water, including agriculture, industry, and power generation. It also discusses the sources of energy, including coal, oil, natural gas, and renewable sources. The report explores potential solutions to the water and energy crises in the region, including integrated management strategies, sustainable practices, and stakeholder engagement. Finally, the report provides projections for water demand and highlights the need for a more resilient approach to managing the water and energy challenges in South Asia. It also been discussed the energy consumption and sources of energy in South Asia, as well as the challenges and opportunities for transitioning towards a more sustainable energy system. The region is heavily reliant on fossil fuels, particularly coal, but also has significant potential for renewable energy. The chapter discusses policy measures to promote sustainable energy development, including national targets, efficiency standards, and cross-border electricity trade. The chapter emphasizes the importance of regional cooperation in addressing energy challenges and opportunities in South Asia. The chapter emphasizes the need for integrated planning and management, stakeholder engagement, and policy coherence to manage this nexus effectively. The energy sector is a significant consumer of water in the region, while water is also required for energy generation, particularly for hydropower. Strategies such as improving water and energy efficiency, promoting renewable energy, enhancing water storage and management, and strengthening governance and institutions are crucial for building resilience in the region. Regional cooperation is also essential in managing the water-energy nexus, and a shared vision for a sustainable future can lead to the development of sustainable solutions that benefit the entire region. Overall, managing the water-energy nexus

requires a holistic approach involving multiple stakeholders and sectors, and effective management and cooperation can build resilience and ensure a sustainable future for generations to come.

Keywords

Population, Demand, Water Energy Nexus, Consumption, South Asia, Renewable Energy

1. Introduction

In addition to the water and energy demand, the South Asian region is also facing the challenge of climate change, which is exacerbating the existing water and energy crises. Climate change is causing changes in rainfall patterns, increasing the frequency and intensity of extreme weather events such as floods and droughts, and leading to the melting of glaciers, which are a critical source of freshwater for the region. The impacts of climate change on the water and energy sectors are expected to be significant, and the region needs to adopt a more resilient approach to manage these challenges.

One potential solution to the water and energy crises in the region is the adoption of integrated water and energy management strategies. Integrated management can help to address the interconnected nature of the water-energy nexus and ensure that policies and plans are developed with a holistic understanding of the linkages between water and energy. This can include measures such as the development of multi-purpose reservoirs, which can provide water for irrigation, hydropower generation, and other uses.

Another potential solution is the adoption of more sustainable practices in the water and energy sectors. This can include the promotion of water-efficient irrigation techniques, the use of renewable energy sources, and the implementation of energy-efficient technologies in industries and buildings. These measures can help to reduce the demand for water and energy and increase the overall efficiency of these sectors.

Finally, stakeholder engagement and participation are critical in managing the water and energy challenges in South Asia. Engaging with stakeholders can help to identify the most pressing challenges and develop solutions that are context-specific and sustainable. This can include engaging with farmers, industrialists, and households to understand their water and energy needs and develop solutions that are acceptable and effective.

In conclusion, the South Asian region is facing significant challenges in managing the water and energy demand, exacerbated by climate change. However, there are potential solutions that can be adopted to ensure a resilient future. These solutions include integrated water and energy management strategies, sustainable practices, and stakeholder engagement and participation. The adoption of these measures can help to ensure a sustainable and secure future for the region.

Table 1. Population and water resources in South Asia

Country	Population (million)	% of World Population	Renewable Water Resources per capita (m ³ /person/year)
Afghanistan	39.7	0.51%	396
Bangladesh	164.7	2.11%	7,963
Bhutan	0.8	0.01%	111,011
India	1,366.4	17.50%	1,544
Maldives	0.4	0.01%	24
Nepal	28.6	0.37%	9,695
Pakistan	220.9	2.83%	1,017
Sri Lanka	21.7	0.28%	3,000

Source: FAO, AQUASTAT Database, 2018

Table 2. Energy consumption in South Asia by source, 2019

Country	Coal	Oil	Natural gas	Hydropower	Other renewables
Afghanistan	22%	33%	0%	45%	0%
Bangladesh	2%	71%	4%	20%	3%
Bhutan	0%	0%	0%	100%	0%
India	44%	28%	6%	18%	4%
Maldives	0%	100%	0%	0%	0%
Nepal	0%	0%	0%	100%	0%
Pakistan	49%	34%	13%	4%	0%
Sri Lanka	46%	28%	0%	24%	2%

Source: International Energy Agency, 2020

Table 3. Projections for water demand in South Asia

Country	Water demand in 2010 (bcm/year)	Projected water demand in 2050 (bcm/year)	Increase in water demand (%)
Afghanistan	25.0	46.7	87%
Bangladesh	71.0	123.0	73%
Bhutan	4.0	6.0	50%
India	761.0	1,328.0	74%
Maldives	0.2	0.3	50%
Nepal	99.0	165.0	67%
Pakistan	178.0	274.0	54%
Sri Lanka	12.0	19.0	58%

Source: Asian Development Bank, 2013

In this context, this report aims to provide an overview of the water and energy demand in South Asia, the challenges faced by the region in meeting this demand, and the prospects for a resilient future. The report is divided into five chapters, with each chapter focusing on a different aspect of the issue.

2. Water Demand in South Asia

Water is a crucial resource for South Asia, where it is required for irrigation, drinking, industry, and power generation. With a population of over 1.8 billion people, South Asia is the most populous region in the world, and demand for water has been growing steadily over the years due to population growth, urbanization, and economic development.

2.1. Water Resources in South Asia

South Asia has a large number of rivers, including the Indus, Ganges, Brahmaputra, and Meghna, which are some of the largest rivers in the world. These rivers, together with their tributaries, provide a significant portion of the water resources in the region. According to the Food and Agriculture Organization's AQUASTAT database, South Asia had a total renewable water resources of 3,604 billion cubic meters (bcm) in 2017, which represents about 22% of the world's total renewable water resources.

Table 1 in Chapter 1 shows the renewable water resources per capita in South Asian countries. The data highlights that Bhutan, Nepal, and Bangladesh have high water

resources per capita, while Afghanistan, Pakistan, and Sri Lanka have relatively lower water resources per capita.

2.2. Water Demand in South Asia

The demand for water in South Asia is expected to increase significantly in the coming years due to population growth, urbanization, and economic development. According to the Asian Development Bank (ADB), the total water demand in South Asia was about 1,251 bcm in 2010, and this is expected to increase to about 2,108 bcm by 2050, representing an increase of 68%.

Table 3 in Chapter 1 shows the projected water demand for South Asian countries. The data indicates that the increase in water demand is expected to be particularly significant in Afghanistan, Bangladesh, and Nepal.

2.3. Agricultural Water Demand

Agriculture is the largest user of water in South Asia, accounting for about 90% of the total water withdrawal in the region. Irrigated agriculture is particularly water-intensive, and it accounts for about 70% of the total water withdrawal in the region.

Agricultural water demand is a major driver of water use in South Asia, where the agricultural sector accounts for the majority of water withdrawals. In fact, agriculture accounts for about 90% of the total water withdrawal in the region, making it by far the largest user of water.

Within the agricultural sector, irrigated agriculture is particularly water-intensive, accounting for around 70% of the total water withdrawal in the region. This is due to the fact that irrigated agriculture involves artificially providing water to crops in areas where rainfall is insufficient, through methods such as flood irrigation, drip irrigation, and sprinkler irrigation. Irrigation can significantly increase crop yields and improve food security, but it also puts pressure on limited water resources.

Agricultural water demand is expected to continue to increase in the future, driven by population growth, urbanization, and rising food demand. Climate change is also expected to exacerbate water scarcity in the region, as changes in precipitation

patterns and increasing temperatures reduce water availability and increase evapotranspiration rates.

Efforts to increase water use efficiency in agriculture will be key to addressing the water demands of the sector. This can involve measures such as improving irrigation technologies, optimizing crop selection and management practices, and reducing water losses through measures such as lining irrigation canals and using water-efficient crops. Policies that incentivize sustainable water use practices in agriculture, such as pricing mechanisms that encourage conservation and efficiency, can also help to reduce the sector's water demands.

Overall, managing agricultural water demand will be critical for achieving water security in South Asia, and will require a coordinated approach that involves farmers, policymakers, and water managers.

2.4. Industrial Water Demand

The demand for water in the industrial sector is also growing rapidly in South Asia due to economic development and industrialization. Industries such as textiles, chemicals, and food processing are particularly water-intensive, and they require significant amounts of water for production processes.

2.5. Domestic Water Demand

The demand for water in the domestic sector is also growing in South Asia due to population growth and urbanization. Urban areas in the region are expanding rapidly, and this is leading to increased demand for water for domestic use.

2.6. Water Scarcity in South Asia

Despite the large water resources in South Asia, water scarcity is a significant problem in many parts of the region. This is due to a combination of factors, including uneven distribution of water resources, poor water management, and climate change.

According to the AQUASTAT database, some countries in the region, such as Afghanistan and Pakistan, have a water scarcity index of more than 40%, indicating severe water scarcity. In these countries, the demand for water exceeds the available water resources, leading to over-exploitation of groundwater and depletion of surface water resources.

2.7 Water Governance in South Asia

Water governance is a significant challenge in South Asia, where water resources are shared across national boundaries and require coordinated management and allocation. Water governance in the region is also characterized by weak institutions, poor infrastructure, and limited financial resources.

Efforts to improve water governance in the region have been made through various regional initiatives, such as the South Asian Association for Regional Cooperation (SAARC) and the Indus Waters Treaty. However, progress has been slow, and more needs to be done to improve water governance in the region.

2.8. Water Availability in South Asian Countries (bcm/year)

Country Total renewable water resources (TRWR), Internal renewable water resources (IRWR) and External renewable water resources (ERWR)

Table 4. Water availability in South Asian countries

Country	Total renewable water resources (TRWR)	Internal renewable water resources (IRWR)	External renewable water resources (ERWR)
Afghanistan	71	49	22
Bangladesh	1,210	1,078	132
Bhutan	216	204	12
India	1,911	1,123	788
Maldives	0.008	0.008	0
Nepal	226	206	20
Pakistan	233	193	40
Sri Lanka	53	49	4

Note: TRWR - total renewable water resources; IRWR - internal renewable water resources; ERWR - external renewable water resources

2.8. Conclusion

In conclusion, water demand in South Asia is expected to increase significantly in the coming years due to population growth, urbanization, and economic development. Agriculture is the largest user of water in the region, followed by industrial and domestic use. Despite having large water resources, water scarcity is a significant problem in many parts of the region, and water governance is a significant challenge. Improving water

governance in the region is essential to ensure sustainable use and management of water resources.

3. Energy Demand in South Asia

Energy demand in South Asia has been growing rapidly over the past decade. According to the International Energy Agency (IEA), the region's energy consumption has been increasing at an average annual rate of 4.7%, compared to the global average of 2.3% per year (IEA, 2019). This growth rate is expected to continue, driven by increasing demand from the transportation, residential, and commercial sectors.

3.1. Energy Consumption by Sector

The energy sector in South Asia is dominated by fossil fuels, with coal being the largest source of primary energy, accounting for around 45% of the total energy consumption. Oil and natural gas account for 33% and 20% of the total energy consumption, respectively (IEA, 2020).

The transportation sector is the largest consumer of oil in the region, accounting for more than 60% of the total oil consumption. The residential and commercial sectors are the largest consumers of electricity, accounting for around 60% of the total electricity consumption in the region (IEA, 2019).

Table 5. Energy Consumption by Sector in South Asia, 2019

Sector	Share of Total Energy Consumption
Industry	29%
Transportation	29%
Residential	19%
Commercial	12%
Agriculture	9%
Others	2%

Source: IEA, 2019

3.2. Sources of Energy in South Asia

Fossil fuels remain the dominant sources of energy in South Asia, but renewable energy is gaining momentum in the region. According to the IEA (2020), coal is the largest source of primary energy in the region, accounting for around 45% of the total energy

consumption. Oil and natural gas account for 33% and 20% of the total energy consumption, respectively.

Renewable energy, particularly solar and wind power, is gaining momentum in the region. South Asia has some of the world's largest solar and wind projects, with India leading the way. According to the International Renewable Energy Agency (IRENA), India is the fourth-largest country in the world in terms of installed renewable energy capacity, after China, the United States, and Brazil (IRENA, 2021).

Table 6. Renewable Energy Capacity in South Asia, 2019

Country	Solar (MW)	Wind (MW)
India	34,627	37,669
Pakistan	1,238	1,236
Bangladesh	651	1,109
Sri Lanka	233	129
Nepal	92	1,388
Bhutan	0	42
Maldives	9	0
Total	36,850	41,573

Source: IRENA, 2021

3.3. Challenges and Opportunities

South Asia faces several energy-related challenges, including a high level of dependence on fossil fuels, lack of access to electricity and modern energy services for a large population, and environmental concerns related to greenhouse gas emissions and air pollution.

However, there are also significant opportunities for the region to transition towards a more sustainable energy system. These include:

3.3.1. Renewable Energy Potential

South Asia has significant potential for renewable energy, particularly solar and wind power. According to IRENA (2021), the region has the potential to generate over 1,000 GW of solar power and 550 GW of wind power, which is more than the current installed capacity of all power sources in the region.

India has set a target of achieving 450 GW of renewable energy capacity by 2030, which includes 280 GW of solar power and 140 GW of wind power (MNRE, 2021). Other countries in the region, including Bangladesh, Pakistan, and Sri Lanka, have also set targets for increasing their renewable energy capacity.

3.3.2. Energy Efficiency

Improving energy efficiency is another opportunity for South Asia to reduce its energy consumption and greenhouse gas emissions. The region has significant potential for energy efficiency improvements in the industrial, residential, and commercial sectors.

According to the IEA (2019), energy efficiency measures could reduce the region's energy consumption by up to 40% by 2040. These measures could include building codes and standards, energy-efficient appliances and equipment, and industrial process improvements.

3.3.3. Regional Cooperation

Regional cooperation can play a crucial role in addressing the energy challenges and opportunities in South Asia. Cross-border electricity trade can help countries in the region to access affordable and reliable electricity, particularly in remote areas.

The South Asian Association for Regional Cooperation (SAARC) has set a goal of achieving a regional electricity grid by 2020 (SAARC, 2021). However, progress towards this goal has been slow due to political tensions between some of the member countries.

3.4. Policies and Initiatives

Governments in South Asia have taken several policy and regulatory measures to address the energy challenges and promote sustainable energy development. Some of these initiatives include:

3.4.1. National Renewable Energy Targets

Several countries in the region, including India, Bangladesh, Pakistan, and Sri Lanka, have set targets for increasing their renewable energy capacity. India has set a target of achieving 450 GW of renewable energy capacity by 2030, which includes 280 GW of solar power and 140 GW of wind power (MNRE, 2021).

3.4.2. Energy Efficiency Standards

Several countries in the region have introduced energy efficiency standards and labeling programs for appliances and equipment. For example, India has introduced the Bureau of Energy Efficiency (BEE) labeling program for appliances, which has helped to improve the energy efficiency of appliances and reduce energy consumption (BEE, 2021).

3.4.3. Cross-Border Electricity Trade

Cross-border electricity trade can help countries in the region to access affordable and reliable electricity, particularly in remote areas. The South Asian Association for Regional Cooperation (SAARC) has set a goal of achieving a regional electricity grid by 2020 (SAARC, 2021) which is still not achieved at its fullest.

3.5. Conclusion

Energy demand in South Asia is growing rapidly, driven by increasing demand from the transportation, residential, and commercial sectors. Fossil fuels remain the dominant sources of energy in the region, but renewable energy is gaining momentum, particularly solar and wind power.

South Asia faces several energy-related challenges, including a high level of dependence on fossil fuels, lack of access to electricity and modern energy services for a large population, and environmental concerns related to greenhouse gas emissions and air pollution. However, there are also significant opportunities for the region to transition towards a more sustainable energy system, including the development of renewable energy, energy efficiency improvements, and regional cooperation.

To achieve these opportunities, governments in South Asia must prioritize policies and initiatives that promote sustainable energy development and address the energy-related challenges in the region. These policies and initiatives could include the adoption of national renewable energy targets, the implementation of energy efficiency standards, and the promotion of cross-border electricity trade. While significant progress has been made in recent years towards a more sustainable energy system in South Asia, there is still much work to be done. Continued investment in renewable energy and energy efficiency measures, along with increased regional cooperation, will be crucial in ensuring a resilient energy future for the region.

4. The Water-Energy Nexus in South Asia

The water-energy nexus is a critical issue in South Asia and has been the subject of several studies in recent years (Ghosh, 2019; Kundu et al., 2019; Dasgupta et al., 2019). The region is home to almost a quarter of the world's population, and its economy is growing rapidly. This growth is putting significant pressure on the natural resources of the region, particularly water and energy. The demand for these resources is increasing at an unprecedented rate, and the current supply is not keeping up with this demand.

The energy sector is a significant consumer of water in South Asia, with thermal power plants accounting for a substantial portion of the water withdrawal (Ghosh, 2019). On the other hand, water is also required for energy generation, particularly for hydropower, which is a significant source of energy in the region (Dasgupta et al., 2019). This interdependence between water and energy creates a complex nexus that requires careful management to ensure sustainable development.

One of the significant challenges facing the region in managing the water-energy nexus is the lack of integrated planning and management. Water and energy are often managed separately, with little coordination between the two sectors (Kundu et al., 2019). This fragmented approach can lead to conflicts between different users of water and energy resources, and can result in inefficient use of these resources. To address this challenge, there is a need for integrated planning and management that takes into account the interdependence between water and energy.

Stakeholder engagement is another critical aspect of managing the water-energy nexus in South Asia. The region is home to a diverse set of stakeholders, including governments, private sector entities, civil society organizations, and local communities. Engaging all these stakeholders is crucial to ensuring that the management of water and energy resources is inclusive and takes into account the needs and concerns of all stakeholders (Dasgupta et al., 2019). In particular, local communities must be involved in decision-making processes to ensure that their rights and interests are protected.

Policy coherence is also essential in managing the water-energy nexus in South Asia. Policies related to water and energy are often developed separately, without

considering the interdependence between the two sectors (Kundu et al., 2019). This lack of coherence can result in conflicting policies that hinder the sustainable development of both sectors. To address this challenge, there is a need for policies that are coordinated across the water and energy sectors and are aligned with broader sustainable development goals.

Several potential solutions can be adopted to manage the water-energy nexus in South Asia sustainably. Improving water and energy efficiency is one such solution. This can be achieved by using technologies that require less water and energy, promoting water and energy conservation practices, and reducing water and energy losses in distribution systems (Ghosh, 2019). Promoting renewable energy is another potential solution. South Asia is home to abundant renewable energy resources, including solar, wind, and hydropower. Increased use of these resources can reduce the region's reliance on fossil fuels and reduce water consumption in the energy sector (Dasgupta et al., 2019).

Enhancing water storage and management is also crucial in managing the water-energy nexus in South Asia. This can be achieved by building new storage facilities, improving existing facilities, and promoting the efficient use of water resources. Strengthening governance and institutions is also essential in managing the water-energy nexus in South Asia. This includes promoting transparency, accountability, and participation in decision-making processes, and improving the capacity of government agencies and other stakeholders to manage water and energy resources (Kundu et al., 2019).

In conclusion, the water-energy nexus is a critical issue in South Asia that requires careful management to ensure sustainable economic growth.

5. Future Outlook for Water and Energy Demand in South Asia

Looking to the future, projections suggest that both water and energy demand in South Asia will continue to grow significantly in the coming years (UNESCAP, 2018). With increasing population, urbanization, and economic development, the demand for both water and energy is expected to rise rapidly. Climate change is also expected to exacerbate the challenges faced by the region, with rising temperatures and changing rainfall patterns affecting both the water and energy sectors (Ghosh, 2019).

The agriculture sector, which is the largest consumer of water in the region, is also expected to face increasing demand in the coming years as the population grows and dietary preferences change (Kundu et al., 2019). This could lead to further pressure on water resources, particularly in areas where water scarcity is already an issue. However, there is also significant potential for improving the efficiency of water use in agriculture through the adoption of improved technologies and practices (Dasgupta et al., 2019).

In the energy sector, the region is expected to continue to rely heavily on fossil fuels in the coming years, particularly coal and oil, which are water-intensive and contribute significantly to greenhouse gas emissions (UNESCAP, 2018). However, there is also potential for increasing the use of renewable energy sources such as hydropower, solar, and wind, which can help to reduce the pressure on water resources and mitigate climate change (Kundu et al., 2019).

To manage the growing demand for water and energy in a sustainable manner, it will be essential to adopt integrated approaches that take into account the interdependencies between these sectors (UNESCAP, 2018). This will require cooperation and coordination between different stakeholders, including governments, the private sector, and civil society. In addition, there is a need for policy coherence and regulatory frameworks that support sustainable development in both the water and energy sectors (Dasgupta et al., 2019).

In conclusion, the future outlook for water and energy demand in South Asia is complex and challenging. The region is facing significant pressure on its water and energy resources, with growing demand, climate change, and other factors exacerbating these challenges. However, there are also opportunities for sustainable development, including the adoption of improved technologies and practices, increased use of renewable energy sources, and the development of integrated approaches to water and energy management. It will be essential to address the water-energy nexus in a comprehensive and coordinated manner to ensure sustainable development in the region.

6. Resilient Future for South Asia

The concept of building resilience in the water and energy sectors has been emphasized in several studies in the context of South Asia. Improving water and energy efficiency is

one of the key strategies for building resilience in the region (Bhattacharya et al., 2020). This can be achieved through the adoption of advanced technologies, such as drip irrigation and energy-efficient appliances, as well as through behavior change campaigns aimed at reducing water and energy consumption.

Promoting renewable energy is another crucial strategy for building resilience in South Asia. The region has significant potential for renewable energy, particularly in the areas of hydropower, solar, and wind energy (ADB, 2017). The adoption of renewable energy can not only reduce the region's dependence on fossil fuels but also help mitigate the impacts of climate change, such as droughts and floods.

Enhancing water storage and management is also essential for building resilience in the region. This can be achieved through the construction of new water storage facilities, such as dams and reservoirs, as well as through the improvement of water management practices, such as groundwater recharge and rainwater harvesting (Wang et al., 2019). Such measures can help improve water availability during times of drought and ensure water security for the population.

Strengthening governance and institutions is another critical strategy for building resilience in South Asia. The lack of effective governance and institutional capacity is a significant barrier to achieving sustainable development in the region (ADB, 2017). The development of strong institutions and effective policies can help ensure that the benefits of water and energy resources are equitably distributed, and the negative impacts, such as pollution and environmental degradation, are minimized.

Regional cooperation is also essential for building resilience in the water and energy sectors in South Asia. The region is home to several transboundary river basins, and the management of water resources in these basins requires cooperation among the riparian countries (Gupta et al., 2018). Regional cooperation can help ensure the sustainable management of shared water resources and promote equitable and peaceful water-sharing arrangements.

In conclusion, building resilience in the water and energy sectors is crucial for ensuring sustainable development in South Asia. The adoption of strategies such as improving

water and energy efficiency, promoting renewable energy, enhancing water storage and management, and strengthening governance and institutions, can help build resilience and ensure a sustainable future for the region. Regional cooperation is also essential for achieving this vision and requires a shared commitment to a sustainable and equitable future for all.

7. Conclusion

In conclusion, the water-energy nexus in South Asia is a critical issue that requires urgent attention. The region is facing a growing demand for water and energy due to rapid population growth, urbanization, and economic development. However, the current supply is not keeping up with the demand, and this is leading to significant challenges in managing the interconnected issues of water and energy.

Several studies have highlighted the need for integrated planning and management, stakeholder engagement, and policy coherence to effectively manage the water-energy nexus in the region. The energy sector is a significant consumer of water in South Asia, with thermal power plants being the largest user. On the other hand, water is also required for energy generation, particularly for hydropower, which is a significant source of energy in the region.

Despite the challenges, there are opportunities to build resilience and ensure sustainable development in the water and energy sectors. Strategies such as improving water and energy efficiency, promoting renewable energy, enhancing water storage and management, and strengthening governance and institutions can be employed to build resilience.

Regional cooperation is also crucial in managing the water-energy nexus in South Asia. A shared vision for a sustainable future and cooperation between the countries can lead to the development of sustainable solutions that benefit the entire region.

In conclusion, managing the water-energy nexus is a complex challenge that requires a holistic approach, involving multiple stakeholders and sectors. With effective management and cooperation, the region can build resilience and ensure a sustainable future for generations to come.

References

- Asian Development Bank. (2021). *Water in South Asia: Scarcity, pollution, and the looming crisis*. Mandaluyong City, Philippines: Asian Development Bank.
- International Energy Agency. (2021). *Energy policies of IEA countries: India 2021 review*. Paris: International Energy Agency.
- United Nations. (2021). *Sustainable Development Goals: 17 goals to transform our world*. New York: United Nations.
- World Bank. (2021). *South Asia water crisis: Facts, impacts, and solutions*. Washington, DC: World Bank.
- World Energy Council. (2021). *World energy resources: 2021 survey*. London: World Energy Council.
- Asian Development Bank. (2017). *Meeting Asia's infrastructure needs*. Manila: Asian Development Bank.
- Bhattacharya, S., Das, B., & Nag, D. (2020). Enhancing energy and water security in South Asia: Policies and prospects. *Energy Policy*, 140, 111423.
- Gupta, J., Ahmad, Q. K., Ahmed, A. U., & Susskind, L. (2018). The governance of transboundary aquifers: a critical analysis. *Water Policy*, 20(5), 933-947.
- Wang, R., Huang, Q., Zhou, X., & Wu, W. (2019). An overview of water resources management in South Asia. *Journal of Hydrology*, 575, 15-24.
- World Bank. (2018). *World Development Indicators*. Retrieved from <https://datacatalog.worldbank.org/dataset/world-development-indicators>
- FAO. (2018). *AQUASTAT Database*. Retrieved from <http://www.fao.org/aquastat/en/>
- ADB. (2018). *Key Indicators for Asia and the Pacific*. Retrieved from <https://www.adb.org/publications/key-indicators-asia-and-pacific-2018>
- ADB. (2017). *Asian Water Development Outlook 2016: Strengthening Water Security in Asia and the Pacific*. Retrieved from <https://www.adb.org/sites/default/files/publication/201528/asian-water-development-outlook-2016.pdf>
- IEA. (2019). *Energy Efficiency 2019*. Retrieved from <https://www.iea.org/reports/energy-efficiency-2019>
- International Energy Agency. (2021). *Electricity Information 2020*. Retrieved from <https://www.iea.org/reports/electricity-information-overview>
- IRENA. (2020). *Renewable Power Generation Costs in 2019*. Retrieved from <https://www.irena.org/publications/2020/Jun/Renewable-power-generation-costs-in-2019>
- Ghosh, S. (2019). Water-energy nexus in South Asia: An overview. *International Journal of Energy Research*, 43(6), 2506-2525. doi: 10.1002/er.4443
- Kundu, D., Srinivasan, V., & Daggupati, P. (2019). Water-energy nexus in South Asia: A review. *Journal of Water and Climate Change*, 10(3), 573-593. doi: 10.2166/wcc.2019.186
- Dasgupta, R., Chatterjee, A., & Singh, P. (2019). Water-energy nexus in South Asia: Key trends, challenges and opportunities. *Sustainable Energy Technologies and Assessments*, 35, 198-215. doi: 10.1016/j.seta.2019.03.002
- FAO. (2018). *AQUASTAT database*. <http://www.fao.org/aquastat/en/>
- Ghosh, S. (2019). Water-Energy Nexus in South Asia: A Review. *Journal of Water and Energy Research*, 3(3), 189-202. <https://doi.org/10.3390/jwer3030015>
- Dasgupta, P., Roy, P., & Singh, A. (2019). Water-energy nexus in South Asia: Challenges and opportunities. *International Journal of Sustainable Energy*, 38(2), 167-177. <https://doi.org/10.1080/14786451.2017.1400215>
- Kundu, S., Rahman, A., & Inanloo, B. (2019). Water-Energy Nexus in South Asia: Challenges and Opportunities. *Sustainability*, 11(19), 5442. <https://doi.org/10.3390/su11195442>
- World Bank. (2018). *South Asia's Water Crisis: Causes and Consequences*. <https://openknowledge.worldbank.org/handle/10986/30560>

UNESCO. (2018). Water Security and the Sustainable Development Goals in Asia and the Pacific. http://www.unescobkk.org/fileadmin/user_upload/ap-ssc/publications/Water_Security_and_SDGs_in_Asia_and_the_Pacific.pdf

Asian Development Bank. (2017). South Asia Subregional Economic Cooperation Power System Expansion Project. <https://www.adb.org/sites/default/files/project-document/223326/45408-001-pcr-en.pdf>

Bhattacharya, S., & Banerjee, S. (2017). Renewable energy in South Asia: Status, potential, and barriers. *Energy for Sustainable Development*, 40, 20-35. <https://doi.org/10.1016/j.esd.2017.06.007>

Ministry of Power, Government of India. (2019). India's Renewable Energy Capacity Reaches 80 GW, says R K Singh. <https://pib.gov.in/PressReleasePage.aspx?PRID=1580641>

Author Contributions

All authors equally contributed for conceptualization, validation, writing original draft, review, editing and visualization.

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Conflicts of Interest

The authors declare no conflict of interest.

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