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Entrepreneurship in Water Hygiene and the Salts Contained therein, Considering Geographical Conditions and its Impact on Hair Health, with an Approach to the Attrition Entrepreneurship Theory of the United Nations Sustainable Development Goals

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Abstract
The availability of safe and clean water is critical in ensuring public health and economic development. United Nations Sustainable Development Goal 6 (SDG 6) aims for universal access to clean water and sanitation and the sustainable management of water and sanitation by 2030. In addition to public efforts, entrepreneurship has emerged as a key innovation and adaptive strategy in the water, sanitation, and hygiene (WASH) sector. The quality of water, especially the level of dissolved salts and minerals like calcium and magnesium, is highly dependent on geographical factors. These mineral components can be both problematic and opportunistic, not only affecting water infrastructure and usability but also individual health outcomes, including hair quality. This review examines the relationship between water hygiene, mineral content, and hair health in the context of broader entrepreneurial engagement and the achievement of SDGs. It also presents an "attrition entrepreneurship" approach, which focuses on the incremental, grassroots innovation process that can systematically address water quality issues and make a significant contribution to the achievement of sustainable development goals.

Keywords: Entrepreneurship, Water, Sustainable Development Goals

I. Introduction

The Sustainable Development Goals (SDGs) of the United Nations are a holistic and integrated approach to deal with the interrelated challenges of the social, environmental, and economic nature. Instead of addressing specific problems, the SDGs have a holistic approach to understand the interdependence of nature and human development. The SDGs cover a broad spectrum of areas, such as the environmental protection of the earth's ecosystems, sustainable water management, conservation of soil, and resilience to climate change.

Moreover, the SDGs also cover the agricultural sector by promoting food security, sustainable agriculture, and land use. The impact of the SDGs also extends to the life sciences and medical sciences by giving importance to public health, disease prevention, sanitation, and access to clean water. The integrated approach of the SDGs also promotes collaboration among different disciplines and sectors by ensuring that the development in one area, such as water quality and soil, also helps in developments in other areas, such as agriculture, biodiversity, and health. Water and hygiene are closely associated with health, development, and equity. The Sustainable Development Goals (SDGs) adopted by the United Nations, and specifically SDG 6, highlight the need for clean water, sanitation, and hygiene as essential for human health and well-being. SDG 6 sets specific targets for the provision of safe drinking water, sanitation, and improved water quality by reducing pollution and treating wastewater. The achievement of these targets is not a straightforward process and involves not only significant investments in infrastructure but also innovative

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enterprise approaches to fill the gaps in the existing infrastructure.

The water and sanitation entrepreneurship environment is usually characterized by a lack of institutional capacity and water quality problems. According to a study, micro and small enterprises in the water and sanitation sector are important in enhancing access to basic services and promoting hygiene practices, especially in areas where the public water sector has been decentralized or underfunded. In this case, it is important to understand the content of salts and minerals in water, which differ from one location to another, as mineral content influences infrastructure and health outcomes.

Hair quality is one of the health aspects that are affected by the quality of water and mineral content, which in turn affects the quality of hair. Although the effect of water salts on human health is not as widely explored as other health aspects, studies have shown that the high mineral content of water, including calcium and magnesium, can have an effect on hair quality and scalp conditions.

Water Quality, Salts, and Geographical Conditions

Water Quality and Mineral Content

The quality of water depends on physical, chemical, and biological properties, which differ according to geography. Salinity, electrical conductivity, and dissolved salts (such as calcium, magnesium, and sulfate) are affected by geological characteristics, soil type, and climatic factors of a particular area. Hard water, which contains high levels of calcium and magnesium ions, is common in many regions around the world due to geological factors.

Water hardness is not only dependent on the usability of water (such as soap lathering and scaling), but it also has proven effects on public and environmental health. Although the guidelines for drinking water take into account salt levels for cardiovascular and renal health, the type of salts also affects the interaction of water with biological tissues. For example, Researchers explain that water with high mineral levels, particularly magnesium chlorides and calcium chlorides, causes permanent hardness, which affects human experience with water quality.

The Role of Geography in Water Composition and Access

Geographic conditions also have a significant effect on the water composition. In arid and semi-arid regions, the groundwater could have a high mineral content due to the dissolution of rock formations along the path, making it more saline or mineralically hard. Conversely, in regions where there is ample rainfall, the water composition could be soft but vulnerable to other contaminants such as pathogens and pollutants.

Geographic conditions also affect the availability of water. In rural settings, there could be a lack of water infrastructure, and people could rely on untreated water sources, which could have a high mineral content.

Hair Health and Mineral Content in Water

Biological Impacts of Minerals on Hair

Biological effects of water salts on hair health are mainly caused by direct contact during washing and bathing. Calcium and magnesium, the major contributors to water hardness, can cause the formation of complexes with soap and shampoo, leading to deposits on hair surfaces and scalp. These deposits can cause dullness, dryness, and brittleness. Although some controlled studies showed no significant difference in hair strength when subjected to hard and soft water, other studies have shown that exposure to high salt concentrations for a prolonged period can increase mineral deposits on hair surfaces. A statistically significant decrease in hair strength was observed when hair was treated with hard water compared to deionized water.

Pathophysiological Mechanisms

The interaction between minerals in water and hair keratin and lipids is complex. High levels of calcium and magnesium can react with fatty acids in shampoos, forming an insoluble film on the hair cuticle that prevents moisture from penetrating, causing dryness. The alkalinity of hard water may also affect the scalp's natural pH levels, potentially causing increased sensitivity and irritation. These biochemical reactions differ from one geographical location to another based on the inherent water composition and usage rates.

Clinical and Population-Level Evidence

Epidemiological research on the relationship between the mineral content of water and the health of hair is not widespread, although surveys and observations indicate a relationship between areas with hard water and dryness, breakage, and irritation of the scalp associated with hair. Dermatologists have noted that mineral deposits can inhibit the absorption of moisture, leading to breakage and tangles, particularly in fine or chemically treated hair.

Geography also affects levels of exposure. People living in areas with naturally harder water are constantly exposed, and water treatment becomes a

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crucial part of entrepreneurial and public health initiatives.

Water Hygiene Entrepreneurship: Case Studies and Sustainable Development Goals

Entrepreneurship in Water and Sanitation (WASH)

Water and sanitation entrepreneurship involves a broad spectrum of players, ranging from small-scale water vendors and sanitation service providers to tech-based startups that provide filtration and treatment technologies. These players achieve a variety of SDG 6 targets in multiple ways, including improving access to safe drinking water, upgrading sanitation infrastructure, and promoting hygiene awareness.

Scholars explain that micro and small enterprises (MSEs) operating in the WASH sector in Ethiopia make a substantial contribution to SDG 6 by providing localized clean water and hygiene services. These MSEs usually fill the gaps in services created by public infrastructure, especially in peri-urban or rural settings that lack adequate infrastructure. In addition, Scholars explain that water, sanitation, and hygiene are essential for health outcomes in wider contexts such as oral health, thereby establishing the relationship between water solutions and health sectors.

Theoretical approaches such as sustainopreneurship emphasize the role of entrepreneurship in achieving sustainable development objectives. Sustainopreneurship encourages entrepreneurship that focuses on social and environmental objectives in addition to economic objectives. In water hygiene, this means developing technologies that can improve water quality, decrease harmful contaminants, and promote health outcomes in sustainable ways.

Attrition Entrepreneurship and SDG Theory

A new paradigm that may be applied to the achievement of the SDGs is attrition entrepreneurshipthe notion that small, incremental, and persistent entrepreneurial actions can cumulatively chip away at sustainable practice impediments, especially in industries where major institutional changes are difficult or happen slowly. The notion is that small, incremental, and persistent entrepreneurial actions add up to make a difference in a systemic way.

In the context of SDG 6, attrition entrepreneurship points to the fact that micro-innovations such as community water purification, mobile water quality testing, or softening solutions can cumulatively address inequalities and help achieve universal access to clean water and sanitation, especially in regions where geography makes water quality more difficult.

Integrating Water Quality and Entrepreneurship in Practice

Technological and Market Solutions

Water entrepreneurs utilize various technologies, such as solar desalination plants, ion exchange softeners, low-cost filters, and community filtration systems, to respond to geographical differences in water quality and health effects. Technologies designed to meet the geological conditions of a region may be more effective in lowering high salt levels, which impact both infrastructure and health aspects, such as skin and hair conditions.

Water entrepreneurs are also involved in behavior change and health education, which align with SDG 6.2 (access to adequate sanitation and hygiene for all).

Policy and Institutional Support

Public policy and institutional mechanisms can also improve the effectiveness of water hygiene entrepreneurship. Incentives, subsidies, and capacity development activities support the integration of small and medium WASH enterprises into water management systems. Public-private partnerships between government representatives, international bodies, and entrepreneurs can also align market forces with the priorities of the SDGs.

II. Conclusion

Water hygiene and the salts in water are complex phenomena that are influenced by geographical, health, and economic factors. Although the salts in water have an impact on water usage and biological processes like hair health, the larger implications are related to health and the sustainability of infrastructure. Entrepreneurship in the WASH sector is a very effective way of dealing with water quality issues, especially in areas where geographical factors contribute to disparities in access and quality. By placing water entrepreneurship in the context of SDG goals and adopting an attrition entrepreneurship approach, communities can start working towards overcoming challenges in access to clean water and sanitation.

Water sustainability needs collaboration between sectors, innovation, and policies that enable grassroots entrepreneurs. By incorporating health implications, such as those related to water salts and hair health, into the water quality debate, stakeholders can work towards developing more comprehensive and context-specific solutions to

water quality issues, in the larger quest for sustainable development.

References

[1]. Alahmmed, L. M., Alibrahim, E. A., Alkhars, A. F., Almulhim, M. N., Ali, S. I., &Kaliyadan, F. (2017). Scanning electron microscopy study of hair shaft changes related to hardness of water. Indian journal of dermatology, venereology and leprology, 83(6), 740. https://doi.org/10.4103/ijdvl.IJDVL_1119_16

[2]. Addisu, B. M. (2024). Business landscape and growth determinants of micro- and small enterprises working in the WASH sector: Evidence from Ethiopia. Journal of Innovation and Entrepreneurship, 13, Article 79. https://doi.org/10.1186/s13731-024-00427-y

[3]. Benzian H. (2023). SDG 6 - water, sanitation and hygiene are foundational for oral health. *British dental journal*, *235*(6), 359. https://doi.org/10.1038/s41415-023-6337-0

[4]. Byrdie. (2022, March 27). Dermatologists say hard water may damage your hair — here's how to stop it. Byrdie. https://www.byrdie.com/hard-water-hair-treatment-5219723

[5]. Dubey, A. (2022). A study on effects of hard water on human health. Research Ambition: An International Multidisciplinary e-Journal, 6(IV), 15–16. https://doi.org/10.53724/ambition/v6n4.06

[6]. Farzpourmachiani, M., &Farzpourmachiani, A. (2024). Attrition Entrepreneurship Theory, Tubittum, vol. 80, p. 28, Available: www.tubittum.com

[7]. Kioumarsi, H., Naseri Harsini, R., Gizem Özbey, B., Rafiei, B., AlidoustPahmedani, M., Shariman Yahaya, Z., & Rosen, M. A. (2026). Wildlife, biodiversity, and the United Nations sustainable development goals: Synergizing conservation and development for a sustainable future. European Journal of Sustainable Development Research, 10(2), em0367. https://doi.org/10.29333/ejosdr/17816

[8]. Kioumarsi, H., & Liu, B. (2025). Celebrating World Cancer Day: Innovative Biological Approaches to Cancer and their Alignment with Sustainable Development Goals (SDGs). Biological procedures online, 27(1), 3. https://doi.org/10.1186/s12575-025-00263-8

[9]. Luqman MW, Ramzan MH, Javaid U, Ali R, Shoaib M, Luqman MA. To Evaluate and Compare Changes in Baseline Strength of Hairs after Treating them with Deionized Water and Hard Water and its Role in Hair Breakage. Int J Trichology. 2018 May-Jun;10(3):113-117. doi: 10.4103/ijt.ijt_115_16. PMID: 30034190; PMCID: PMC6028999.

[10]. Rosen, M. A., Kioumarsi, H., & Gholipour Fereidouni, H. (2025). Climate action and net-zero emissions. European Journal of Sustainable Development Research, 9(4), em0334. https://doi.org/10.29333/ejosdr/16864

[11]. Srinivasan G, Srinivas CR, Mathew AC, Duraiswami D. Effects of hard water on hair. Int J Trichology. 2013 Jul;5(3):137-9. doi: 10.4103/0974-7753.125609. PMID: 24574692; PMCID: PMC3927171.

[12]. United Nations. (2024). Goal 6: Water and sanitation — United Nations Sustainable Development.

[13]. Zindi, B., & Shava, E. (2022). COVID-19 and the attainment of Sustainable Development Goal 6 (clean water and sanitation) in South Africa. Journal of Local Government Research and Innovation, 3, a58. https://doi.org/10.4102/jolgri.v3i0.58