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## **Urban Agriculture: Slovenia's Water Pollution Prevention Plan**

In the midst of the new technological age, basic rights should be accessible and guaranteed. However, even in developed nations, they are difficult to come by. Some countries have restricted access to basic rights due to economic issues and political conflict, though most people do not realize they contribute to this problem. In Southern Europe, one Balkan nation exemplifies this common issue.

Slovenia is a small, mostly landlocked country in southeastern Europe. Originally part of Yugoslavia, Slovenia is a relatively young nation with diverse landscapes. Slovenia has a population of 2.1 million with over half of the nation urbanized at 55 percent ("Urban Population (% of Total Population) - Slovenia."). Slovenia has a varied climate, influenced by the Alps mountain border and Mediterranean border. The climates in various regions differ based on its location relative to the rugged terrain that makes up Slovenia's geography. Slovenia is a parliamentary democratic republic (Klaus Käßtle). Nearly 30.3 percent of the land is used for agriculture in the northeastern region of the country ("Urban Population (% of Total Population) - Slovenia."). Slovenians grow a vast production of potatoes and wheat (Klaus Käßtle). Much of the farms established are smaller than American farms at seven hectares, compared to America's 180 hectares (Razpotnik, Barica, et. al).

The average Slovenian household size is three, depicting two parents and one child, as of 2021 (Razpotnik, Barica, et. al). To contribute to their traditional values, Slovenia is mostly a patriarchal society. Women are limited to traditionally feminine jobs including teachers and secretaries (*Slovenian Culture: Exploring the Country of Slovenia*). Slovenian families live comfortably in a standard personal home with access to all necessary facilities (Razpotnik, Barica, et. al). A typical meal is hearty and warm, considering the cold climate during the winter and in high elevations. Soup and potato dishes are common ("Facts about Slovenia."). Many ingredients featured in Slovenian cuisine are homegrown or grown locally. ("Facts about Slovenia."). Aside from farming, the manufacturing industry takes control of their economy. Industries such as textiles, machinery, and steel are common workplaces in Slovenia ("Work in Slovenia: All about Working and Living Here."). The unemployment rate is about 4.42%, slightly higher than the US's 3.5% ("Slovenia Unemployment Rate 1991-2023."). While education is accessible and free to Slovenians up to university, not all citizens take the opportunity to attend higher education, preventing them from receiving higher paying jobs (OECD Better Life Index). The average monthly income is 2013.56 EUR, or 2197.80 USD ("Slovenia Wages 2023: Minimum & Average."). The main barriers Slovenians face are the drastic changes brought about from COVID-19 and competition between peers to obtain higher degrees. Ultimately, Slovenia has one of the highest quality lifestyles in Europe.

Despite their advancements, Slovenia still has a water pollution problem. Slovenia is well known for its abundant water bodies and its ambitious goals towards sustainability ("Slovenia: More Ambitious Environmental Action Key to Protect Human Rights, Says UN Expert."). However, water pollution poses a threat to humans and the environment in Slovenia. Water plays as the transport factor in this form of pollution. Water and its contaminants can seep into the soil and underground water sources. Fertilizers and herbicides cause eutrophication in local water ecosystems, harming the aquatic ecosystem and other organisms that interact with it.

The mass production of crops and manufactured goods has resulted in excess amounts of chemicals and other pollutants to breach Slovenian water systems. Municipal dumping in growing landfills cause metal and chemical particulates to pollute the surrounding areas. The issue of water pollution is mostly rooted in

the eastern parts of Slovenia. These regions are the most populated and urbanized (“Global Rural-Urban Mapping Project (GRUMP), V1.”). Affected cities include Celje, Krska, and Maribor (Ambrozic, Spela, et al.). Lakes and rivers are prominent in these areas, therefore creating a reservoir of toxins surrounding these towns. These towns are home to plenty of farms and factories, contributing to their water problems (ICPDR).

The issue of water pollution is not explicitly damaging to a specific gender or age group. Men and women, however, directly contribute to water pollution in their daily routines. Male workers contribute to the dumping of manufacturing waste from factories (*Slovenian Culture: Exploring the Country of Slovenia*). Women are expected to complete household chores, causing cleaning agents to escape into the soil, groundwater, and local water bodies (Ambrozic, Spela, et al.). The Roma community in Slovenia experiences levels of systemic discrimination. These peoples are subjected to live in settlements segregated from the rest of the nation in the southeast. Their homes are poorly built and often lack basic amenities (“Slovenia: ECHR Judgment Is a Blow to Roma Communities.”). These communities use untreated and contaminated water from the local streams. Despite claims from the government to clean these polluted areas, little has been done (“Slovenia: More Ambitious Environmental Action Key to Protect Human Rights, Says UN Expert.”).

Most studies revealing high toxin concentrations are from the early 2000s (Ambrozic, Spela, et al.). In Slovenia’s earlier years, toxin rates were significantly high in the east and west coast. Researchers listed detergents, nitrates, and AOX halogens as common toxins (Ambrozic, Spela, et al.). Upon discovering these findings, the Environmental Agency of the Republic of Slovenia decided to take serious action on this pollution issue and make positive change.

By 2006, the agency regularly tested local rivers and streams. The researchers had a goal to keep water quality levels below the European Commission’s approved 16. (Ambrozic, Spela, et al.). Prior to treatment, Slovenian streams had water qualities varying from 16.5 to 20. Simultaneously, a wastewater treatment facility was built in Ljubljana. Following its establishment, there was a drastic change in water quality, plummeting down to 4. By treating water used by its inhabitants and neighboring industries and decreasing their demand for biochemicals, Slovenia cleaned their streams significantly (Ambrozic, Spela, et al.). Unsuccessful trials occurred in regions with the highest percentage of farmland and areas where the Roma people live.

Because of Slovenia’s excessive discrimination against ethnic groups, a long term solution would require mending relations between the Roma people and the surrounding communities. The Slovenian government would have to provide other means of care and facilities for this marginalized group. However, a short term solution would be to provide these communities and impoverished groups with stream water filtration systems. Clean water is hard to come by for this community (“Slovenia: ECHR Judgment Is a Blow to Roma Communities.”). Therefore, a possible solution would be to establish rain catchment systems in their settlements.

Rain harvesting is a solution that is economically viable and reasonable (“Ending Thirst in Our Generation.”). The containers are long lasting and reusable, eliminating the need for constant replacements. This would work best in Roma settlements because of the high levels of snow and rain received annually. This water would be used in household chores, sanitation, and for consumption. The containers hold a dual purpose of storing their water safely so that it is free from outside contaminants. Rain harvesting is an easy task. By connecting the container to a gutter or placing it outside during rain or snowfall, water will be collected. After boiling the collection, the water should be good for immediate usage. This practice was utilized by The Last Well, a non-profit organization focused on providing clean water to communities in Liberia. This organization was able to achieve their goal within its twelve years

of running due to its flexible strategy towards bringing water to Liberia. By understanding the geography and climate of the towns in Liberia, the organization was able to cater to each area more efficiently.

Non-country affiliated organizations could lead this plan. Amnesty International works for the protection of the Roma community in Slovenia. Much of their work is concentrated on ensuring justice for the communities (“Slovenia: ECHR Judgment Is a Blow to Roma Communities.”). Amnesty International can provide rain harvesting containers to families and provide households with running filtered water, among other amenities.

A concern with this solution is receiving funds. Funding would have to be sourced from donations and Amnesty International. Contacting the Slovenian government may not be possible due to the lack of support from the European Court of Human Rights. In 2020, the court dismissed accusations of right violations against the Roma people (“Slovenia: ECHR Judgment Is a Blow to Roma Communities.”). The Slovenian government refused to provide water and other facilities to the Roma people on the grounds that they did not live in “proper” homes. Therefore, Amnesty International might have to find funds elsewhere.

Another plan for water pollution would work best in the agricultural regions of Slovenia. An adaptation to water pollution, urban aeroponics would reduce the risk of polluted water seeping into crops. Aeroponics is a modern form of agriculture in which crops are grown in the absence of soil. As a replacement, rockwool saturated with plant growth nutrients is used to plant seeds. Water continuously runs through the system, ensuring that the roots do not dry out. The system is electrically powered to ensure the water stays running, consistently recycling the materials that go into it.

The nutrients and water in the system are constantly recycled due to the electric diffuser that promotes water movement. The water continuously transports nutrients throughout the system. In this circular system, no nutrients or water are wasted nor added in the process. This particular part of aeroponics is important to Slovenia’s water pollution problem because it reduces the risk of contaminants breaching the crops. With only a small portion of water used throughout the entirety of crop growth, not only will toxins be prevented from leaching into the water, but agriculturalists will save water, money, and land for their businesses.

Aeroponics is ideal for Slovenia’s growing population. With urban expansion and excessive pollution, traditional agriculture is no longer a sustainable option. Older farming methods result in soil damage and increased runoff into water systems. This creates an endless cycle of polluting water and increasing the usage of chemicals in farming.

To implement this plan, the government would have to be involved in organizing these modern farms. The agriculture sector needs to allot money and provide materials to create the system. Farmers would have to be educated on using aeroponics systems. While it is a simple process, there are many components to consider. Aeroponics can be sensitive to change, specifically the electric diffuser. An electricity source would be needed at all times to keep the water and nutrients moving through the plants. Farmers have to make sure the rockwool does not dry out and that the roots do not become over-saturated with water. The diffuser has to stay running at all times or the entire system of plants could die, making the system more complicated. Another issue would be the limited options for aeroponics. Depending on the size, some plants might be too large to be grown in the system. Slovenian crops like potatoes would be unable to grow because of its underground growth.

Aeroponics can be a model for the future of Slovenian agriculture. Its versatility and easy set up provide an ideal system for farmers to use, excusing the technological difficulties that may occur. This system

protects plants from toxins and soil diseases that often plague crops. In small spaces, aeroponics can yield high harvest for Slovenians.

Water pollution in Slovenia is an issue long from being 100% solved. There are many components to consider, economic and environmental alike. The main takeaway from this issue and its contributing factors is that in order to initiate change, one needs to converge fields. For Slovenia, its people have to adapt to technological advancements and become more socially accepting of marginalized groups. With this in mind, much change could be achieved for all Slovenians. Whether it is by civil justice or modernized agriculture, Slovenian lifestyle can see a brighter future closer than ever before.

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