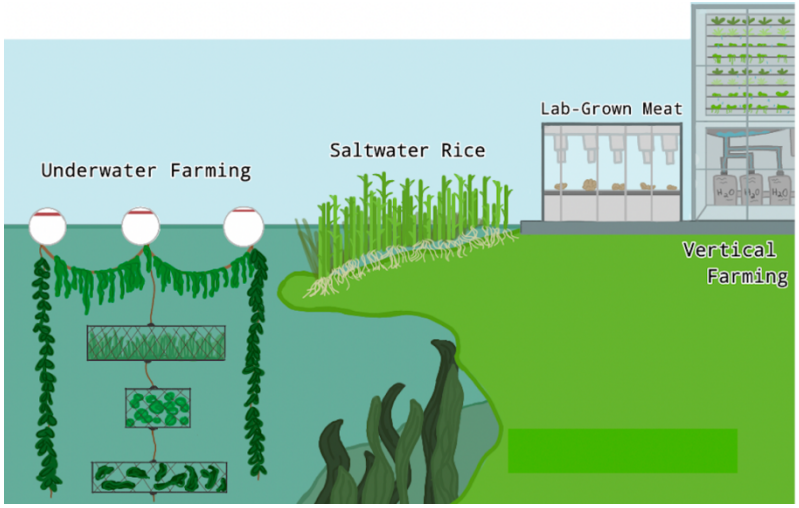
Biyaha Janada
Mogadishu

Once known as Mogadishu, Biyaha Janada is situated on the southern coast of Somalia. Biyaha Janada, or “paradise of water” in native Somali, was renamed by its citizens in the belief that water is essential to all life, an idea central to its new identity and existence.

Founded by Arab and Persian dynasties in the tenth century, Mogadishu was once called the “White Pearl" because of its beautiful beachside resorts. Unfortunately, climate change and political strife led to Mogadishu’s decline. As of 2122, however, we have overcome drought, famine, and wars to now boast a bustling population of nearly three million people who enjoy the city’s services, and diverse career and recreational opportunities. World-renowned poets and artists celebrate the power of water, alongside the traditional Somalian imagery of the proud cheetah. Our scientists and engineers travel across the globe to share life-changing technologies with other arid cities. Citizens proudly wave our traditional blue and white flag – now symbolic of abundant water and shining beaches.

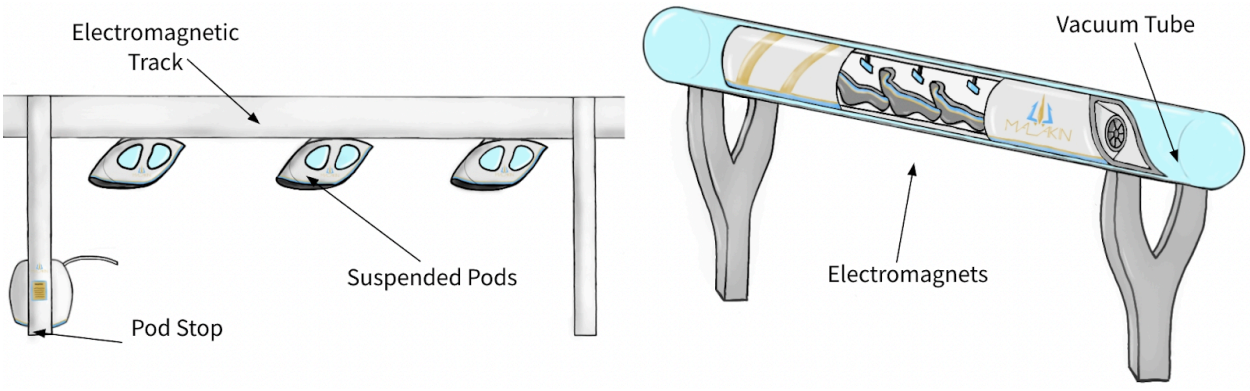
The Representative Democracy of Biyaha Janada provides a variety of services. Citizens play soccer and relax in green spaces throughout the city that are enclosed in air-conditioned, self-healing, UV-coated polycarbonate domes that trap moisture. This material is soft polycarbonate mixed with carbon nanotubes and heals on contact. Citizens are kept safe through Biyaha Janada’s advanced fire-fighting system utilizing non-toxic chemicals in place of water. Our students’ education is provided by teachers that are aided by AI analytical programs that understand their educational needs. To assure our citizens’ health, they wear devices on their arms that instantaneously detect medical needs. If someone is having a medical emergency, aid is automatically summoned.

Our food system consists of many environmentally friendly methods to feed Biyaha Janada. One of those methods is lab-grown meat, which doesn't require slaughtering, uses eleven times less water, twenty-eight times less land, and produces 96% less greenhouse gas emissions than traditional meat production. Biochemical engineers extract muscle cells from an animal before introducing them to yeast-based growth medium. Agricultural engineers also grow plants indoors in large vertical farms utilizing aeroponics that use 95% less water than traditional farming.



Outside, food is produced without the use of freshwater through ocean agriculture. Our city grows seaweed and other aquatic plants vital to our diets, architecture, and economy. Seaweed can be used both for insulation and to replace plastic packaging. Rice is grown in saltwater marshes near our coast. This rice was genetically modified by scientists to thrive amidst salinity. Such advances in ocean agriculture help us boast an overall negative carbon footprint.

For travel within the city, citizens ride pods that run on elevated electromagnetic tracks. This allows more room for green spaces, eliminating the need for roads. Loading stations to the side of the main track at every block allow for non-stop travel. AI controls allow passengers to simply call a pod and input a destination. Hyperloops enable global travel. By using tube-like vacuum chambers combined with electromagnetic suspension and propulsion, the hyperloop does not encounter air resistance or friction, allowing for high speeds.



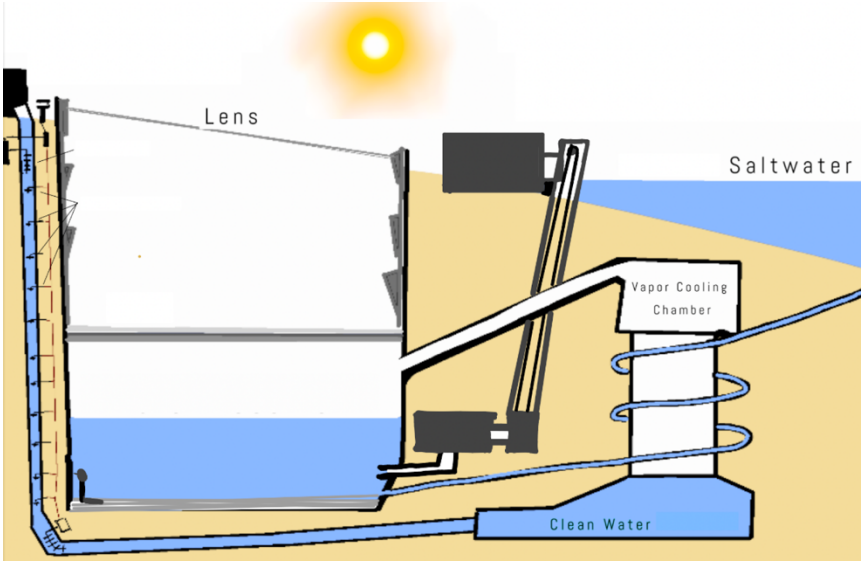
We are proud that neither form of transportation releases any carbon emissions.

Nuclear fusion is our primary source of power because it's clean, safe, and efficient. The recent centennial celebration of 2022's groundbreaking net positive energy from nuclear fusion highlights how far our engineers have come in perfecting the process. We fuse the deuterium and tritium isotopes of hydrogen, extracted from seawater. Harnessing its exponential power, every gallon of seawater can produce as much energy as 300 gallons of gasoline. When two atoms fuse, they release energy (binding energy) because the two fused atoms weigh less than the masses of the individual atoms. Nuclei are all positively charged, repelling each other. To overcome this, atoms must travel extremely fast. These speeds are achieved by heating plasma to about 100,000,000 degrees Celsius. A temperature this high is achievable, but plasma will melt any material that is trying to hold it. To solve this problem, magnets hold the plasma in mid-air in a torus-shaped machine called a Tokamak. Building our nuclear fusion reactor was costly. However, this trade-off was necessary as our energy system will sustain our city supplying almost infinite free energy to our citizens.

Mogadishu has long dealt with droughts, and unfortunately, climate change exacerbated the problem. Rain abated, rivers and lakes dried up, fresh water became scarce, and crops couldn't grow – causing famine, disease, and instability. Without usable water, Mogadishu's

outlook looked bleak, but innovations helped transform it into the now thriving city of Biyaha Janada.

To rejuvenate our city we developed the G.A.P. system, which **G**enerates **A**nd **P**reserves water. As a part of the G.A.P. system, we built large desalination plants along the coast that distill seawater. We have twelve water tanks that are thirty by thirty meters square and forty meters deep. The water in the tanks is only fifteen centimeters deep in order to maximize the surface area for evaporation. Each tank can evaporate its contents six times per day, creating nine million liters of water. A robotic arm sweeps away extraneous salt and minerals to be processed, used, and exported.



It takes 330,000 Joules of energy to bring one liter of water to 100 degrees Celsius and evaporate it. Sunlight directed by lenses provides a portion of the needed energy, and we reduce the amount of energy required by using steam to preheat the water. The remaining energy comes from our nuclear fusion reactor. While constructing desalination plants, some of Biyaha Janada's natural coastline and marine ecosystem were disrupted; however, the importance of water made this trade-off necessary.

Another part of G.A.P. is MOFs, or Metal-Organic Frameworks, which are highly porous materials that capture and store gasses. MOFs consist of metal ions and organic molecules. These systems, developed in collaboration with our material and mechanical engineers, gather water

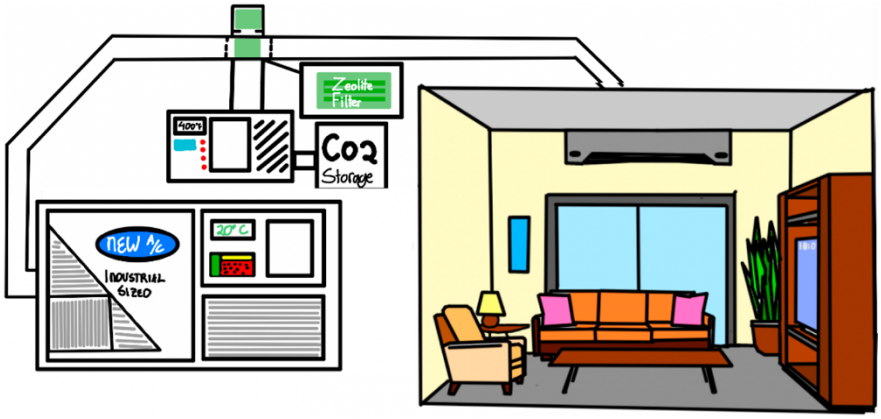
vapor at night and store it. This vapor is collected after it condenses into liquid water during the day. We put our MOF systems on roofs throughout the city, providing some of the water needs for each building in a renewable, sustainable manner.

Electrochemical engineers have worked within G.A.P. to develop underwater oceanic electrolysis units as backup systems. These units consist of submerged semipermeable membranes to filter sea water that cover sealed containers containing electrodes. When electricity is introduced electrolysis splits the water into separate containers of hydrogen and oxygen. This creates a pressure gradient between the interior and exterior of the cell, causing forward osmosis across the membrane. At any time, we can use our stores of oxygen and hydrogen to generate water and electricity through our large hydrogen fuel cells.

To preserve water, we reuse and recycle it utilizing treatment plants. The filters only allow fluids into the treatment process. The remaining solids are sent to composting stations that produce fertilizer for crops. The fluid then goes through the purification process of aeration, chlorination, diffusion, and thermal hydrolysis. In total, the resulting water is clean enough to be used throughout our city.

Even our waste management system is a part of G.A.P. Biomass gasifier generators utilize bio-waste, such as rice husks, to generate energy, run atmospheric water generators that collect steam from the bio-waste to produce water, and sequester carbon into biochar. Biochemical engineers use biochar for fertilizer and in the concrete that supports most of our architecture, thereby sequestering carbon in our buildings. They combine the concrete with *bacillus megaterium* to make the concrete self-healing. We are truly connected to and surrounded by our life-sustaining water.

One of the downsides of our equatorial climate is the need for air conditioning. However, material engineers have equipped our AC systems with zeolite filters to minimize the amount of CO_2 in our atmosphere. As the air in our ventilation system passes through filters, CO_2 is trapped and collected. Eventually, the zeolite must be recharged by releasing the carbon dioxide it has absorbed. To accomplish this, we use stored heat energy from the AC system, along with additional energy, to raise the filter's temperature to 350 degrees. As the CO_2 is released, it's pumped underground where it's compressed and stored in porous rock. Between our carbon-negative AC systems, building materials, waste management, agriculture, and carbon-neutral power and transportation systems, Biyaha Janada has become a world leader in helping reduce the effects of climate change.



Once mired in drought, Mogadishu has become Biyaha Janada, a model for arid cities ravaged by climate change. Our city maintains its robust culture and dynamic traditions, while no longer threatened by droughts within a thriving, carbon-negative metropolis. After a century of innovation, our city's services, plentiful water, and abundant energy allow our citizens to enjoy some time on the white sand beaches of the restored and reinvented white pearl; our paradise of water - Biyaha Janada.

1,492 Words

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