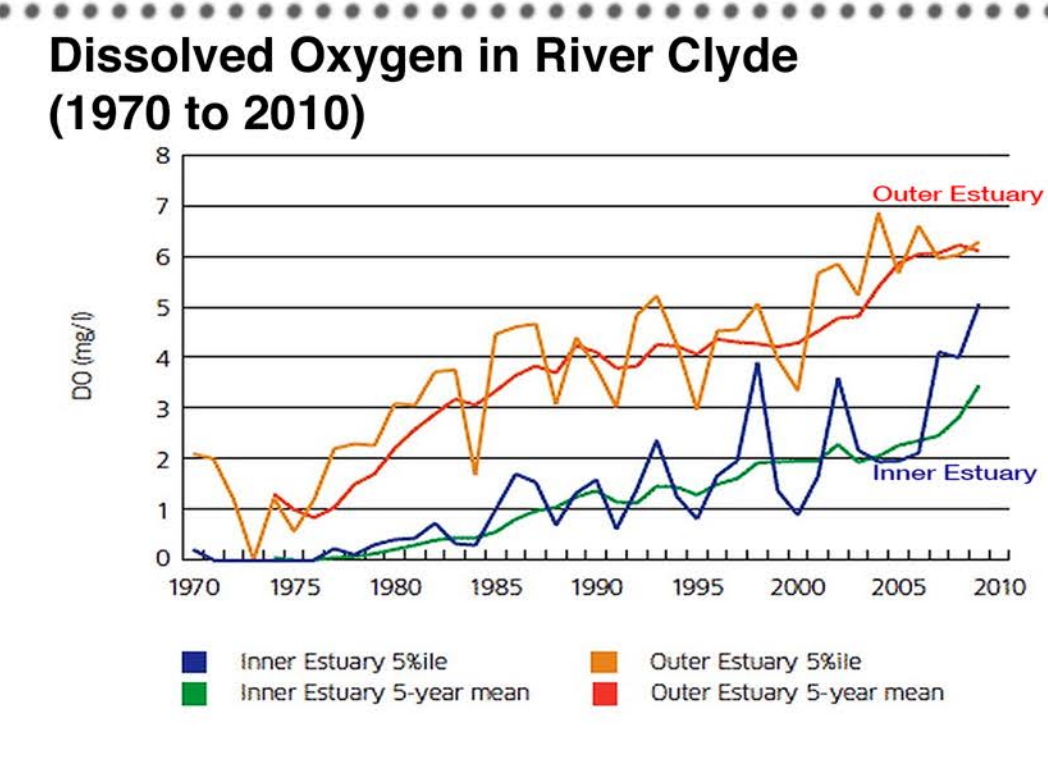
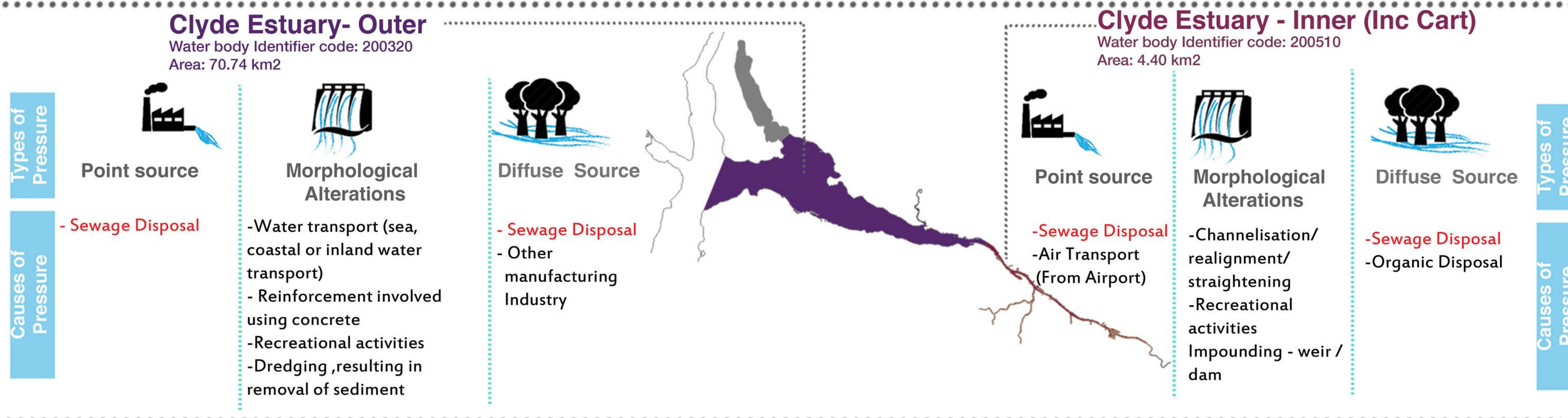




Studies by SEPA in 2012 shows that River Clyde (Outer and Inner Clyde) failed to achieve Water Framework Objective 2015 which is to be in "GOOD" status, while both are in Moderate Status. The main reason causing water pollution is Sewage disposal caused by discharges from Sewage Outlet and Wastewater Treatment Works Outlet to the river.



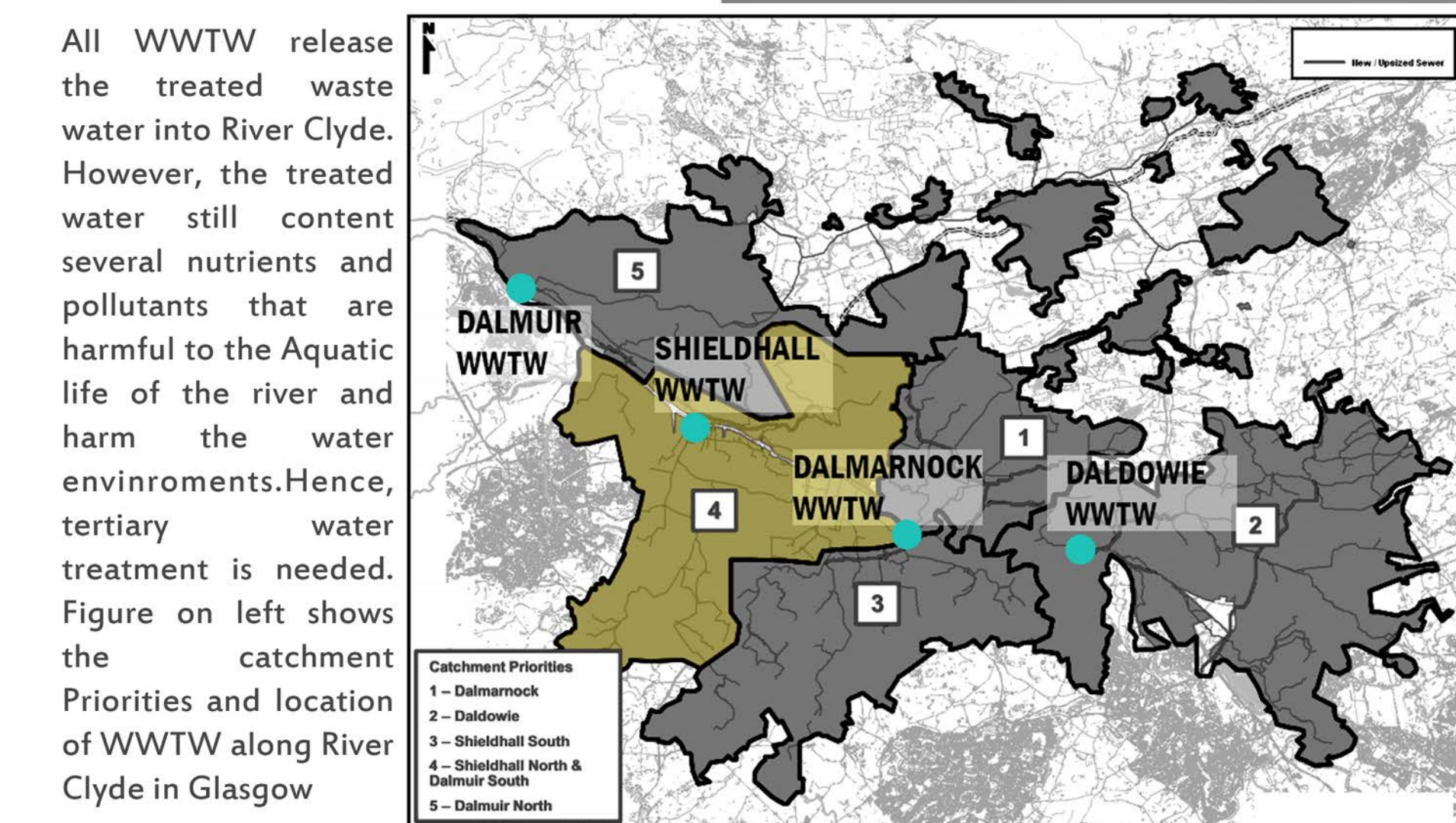
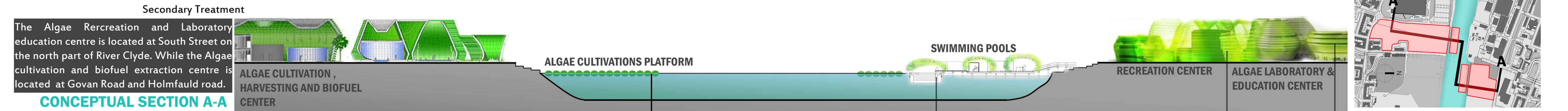
ACTIONS BY AUTHORITIES (2013 onwards)

- Upgrade WWTW facilities and 200 Combined Sewer Overflows (CSO's), or outfall pipes in 5 years time
- Oxygenation of River Clyde (injection of Oxygen into the water) to increase Dissolved Oxygen level.

LOCATION OF WASTEWATER/SEWAGE TREATMENT WORKS ALONG RIVER CLYDE

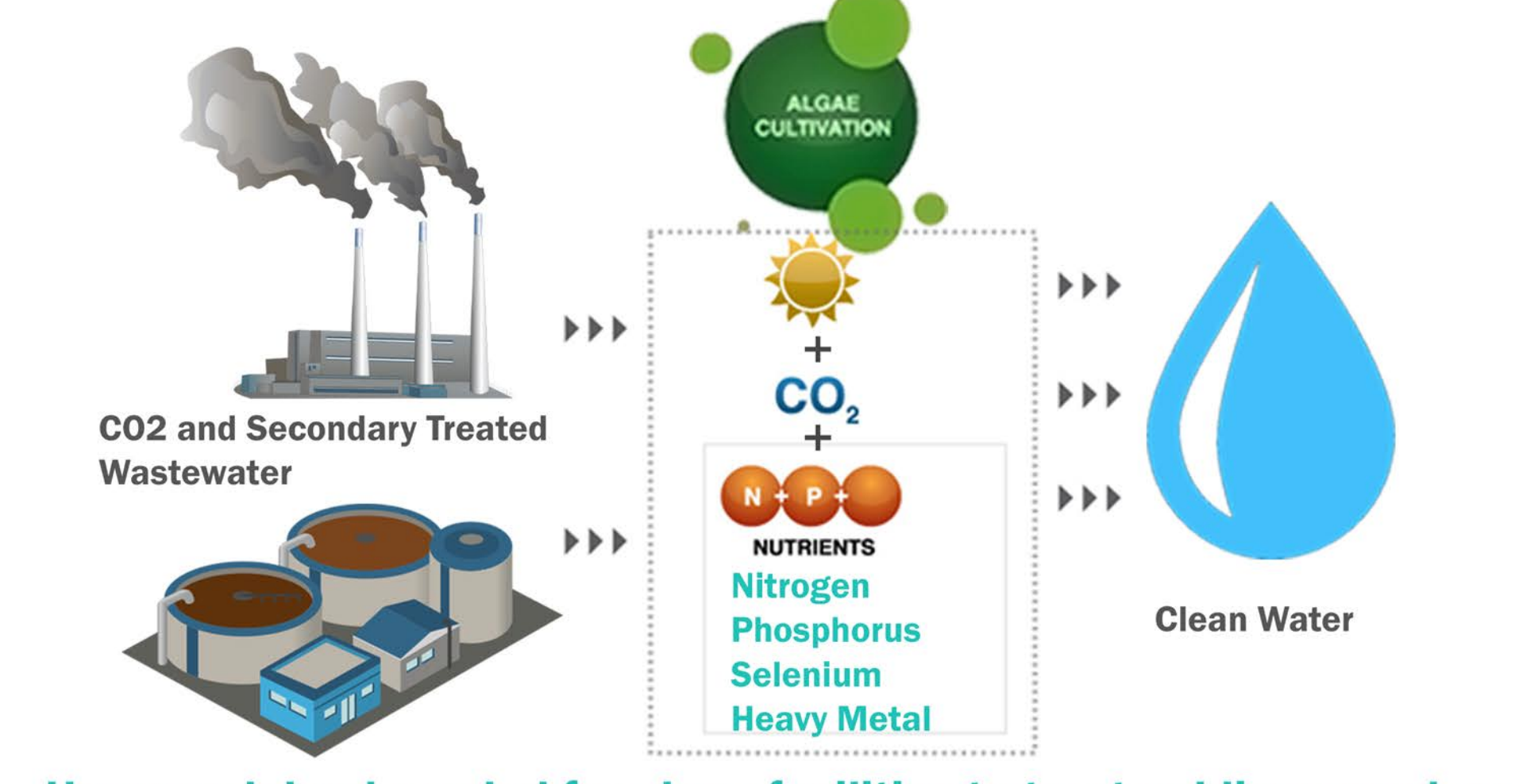


- Dalmuir Waste Water Treatment Works**
Serve: 600,000 People
Treat: 378,000m³ water per day
Secondary Treatment
- Laignpark (Paisley) Sewage Treatment Works**
Serve: 74,000 Peoplet
Secondary Treatment
- Shieldhall Waste Water treatment Works**
Serve: 585,000 People
Secondary Treatment
- Dalmarnock Waste Water Treatment Works Area**
Serve: 370,000 People
Secondary Treatment
- Daldowie Sewage treatment Works**
Serve: 1 Million People
Treat: 540000 sludges m²
Sludge Treatment



TERTIARY WASTE WATER TREATMENT

Wastewater provides both water and fertilizer for algae cultivation and algae provide desirable treatment for the secondary treated wastewater. When provided with untreated wastewater, sunlight and carbon dioxide (CO₂), green algae and associated microbes rapidly convert nutrients and organic carbon from wastewater into renewable biomass.



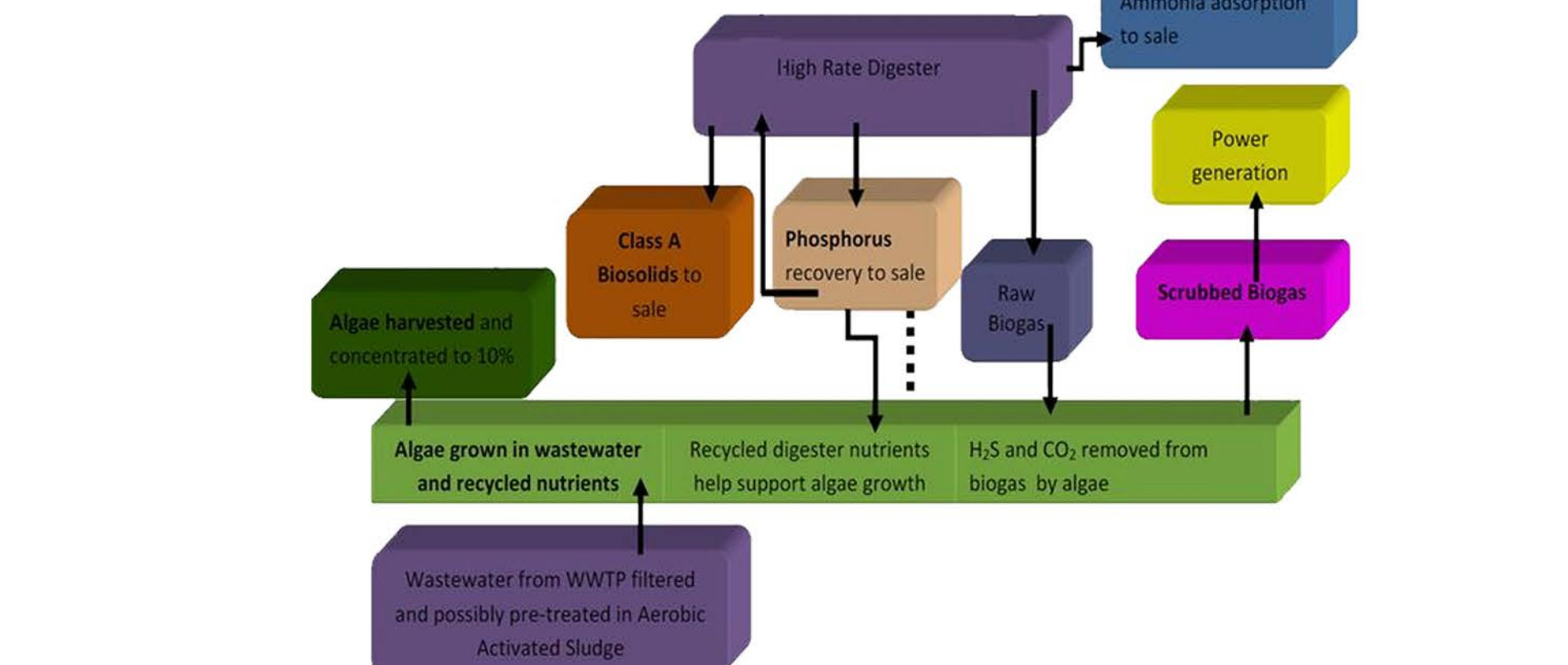
How much land needed for algae facilities to treat public secondary waste water?

An Algae Cultivation centre (using OMEGA system) in Alabama suggested that this system can treat 40,000 gallons of waste water per acre per day. To locate an algae production facility using OMEGA system in the vicinity of the Wastewater Treatment Works (WWTW), for instance in Dalmuir WWTW, which average treat about 250,000m³ of wastewater per day, an area of approximately 152.4acres (616,760.5m²) of algae plant facilities is required.



What do Algae removed from wastewater?

Algae can remove more than 90% Nitrogen (N) and 80% Phosphorus (P), and other contaminants such as Biochemical oxygen demand (BOD); Total suspended solids (TSS); Nutrients that cause eutrophication; Metals (including toxic heavy metals); Organic contaminants, surfactants, phenols and hydrocarbons from the secondary-treated municipal water without adding any other chemical contents.

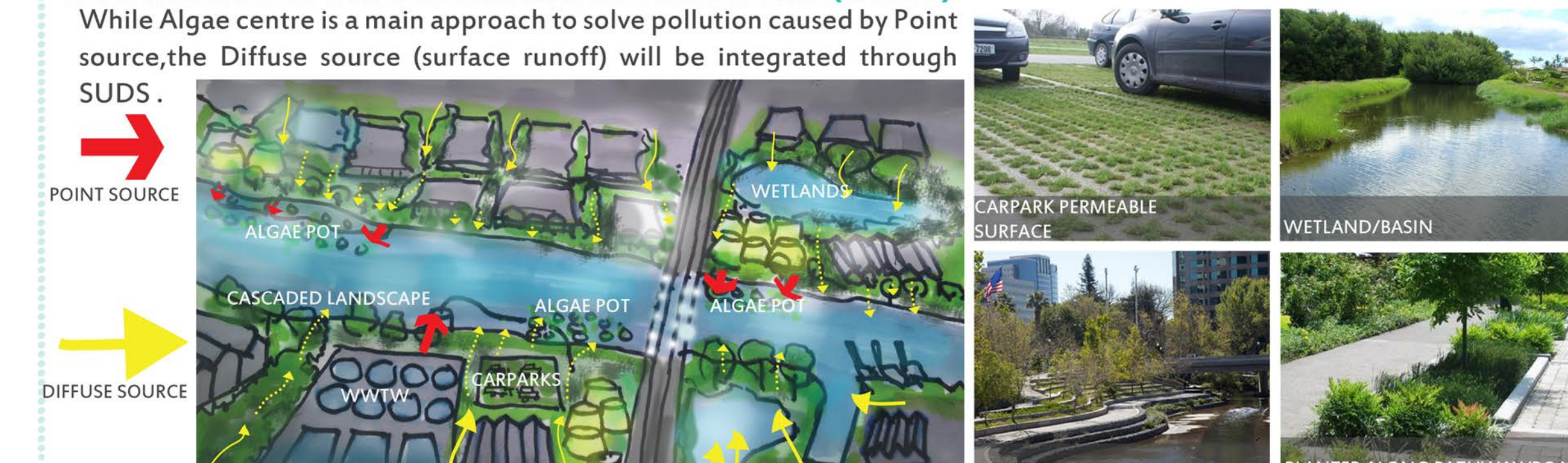
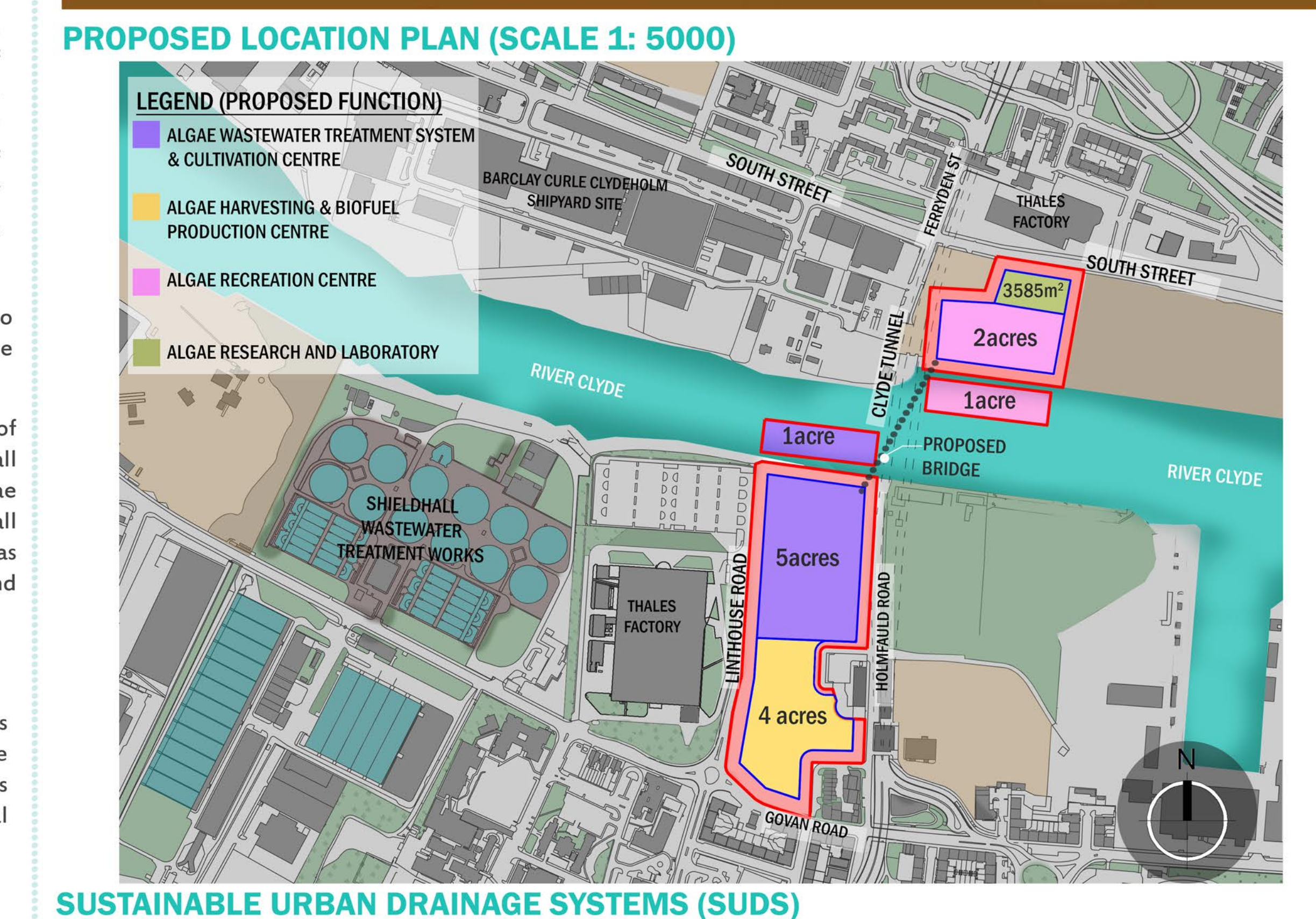
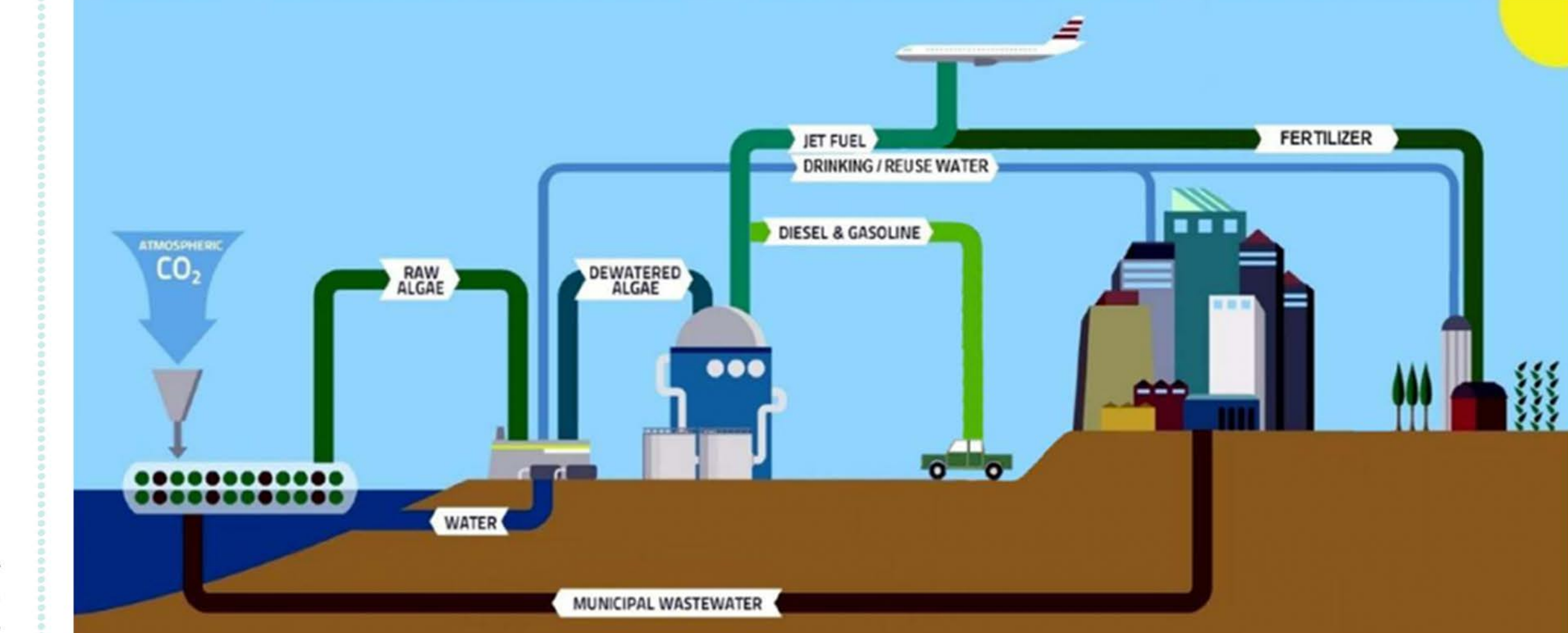


STRATEGIES & OBJECTIVES

Algae Prototype Center have 3 main benefits: An advanced sustainable wastewater treatment, to produce biofuel and as a place recreation activities that generate the people's interest toward River Clyde.

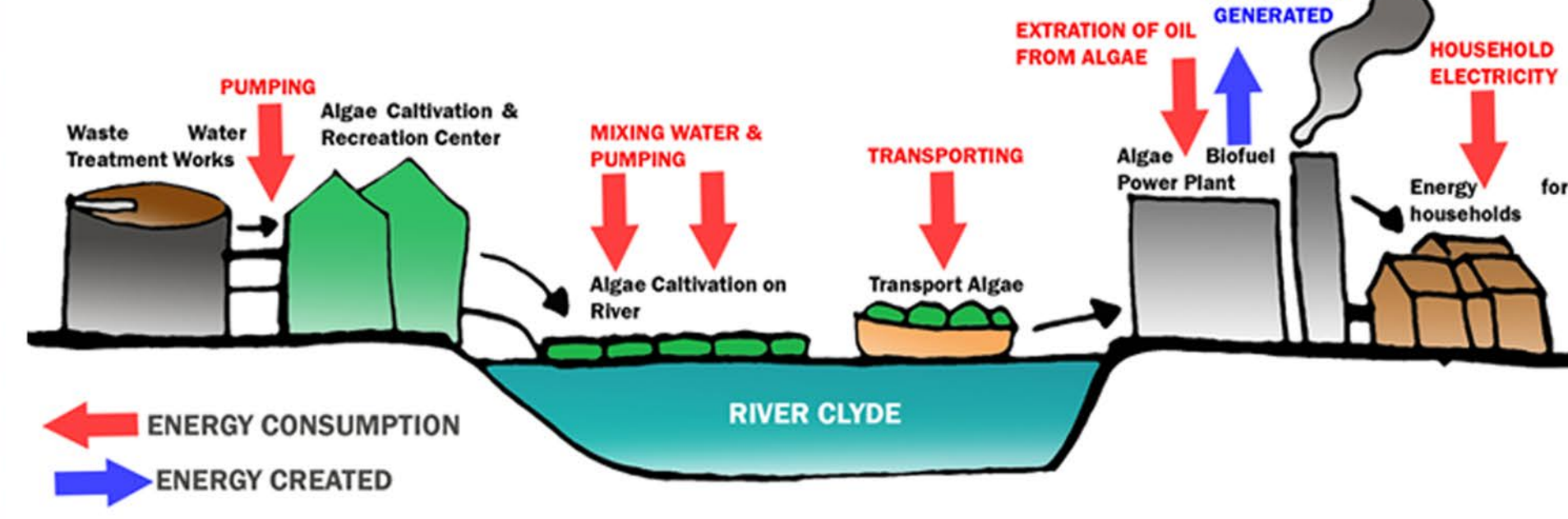


This prototype is proposed in vicinity to Shieldhall Waste Water treatment as an initial strategy to cope with point source pollution. The intention is to develop this system all along River Clyde near to WWTW. If the system is successful, it could further treat sewage from Combined Sewer Outlets by introducing Algae Wastewater Treatments Centre started with Primary Treatment system.



BIOFUEL ENERGY

The proposal of having integrated system is to test whether this integrated planning is feasible to generate enough energy for the nearby neighborhood households.



The main requirements to be considered are the energy used for operating the algae harvesting and extraction of oil (biofuel) from algae.

