



Pysewer: A simple tool for sewer network generation in data-scarce regions





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What is pysewer? Pysewer is a Python package designed to automate the generation of hydraulic-optimised sewer network layouts using minimal data requirements.

How pysewer works

Pysewer's concept combines graph theory with sanitary engineering design to generate a sewer network layout. It approximates the directed Steiner tree (the Steiner arborescence) between all sources (buildings) and the sink (WWTP) by using a repeated shortest path heuristic (RSPH).

Pysewer targets critical gaps in sanitation under UN SG6, enabling rapid deployment of efficient sewer networks and, by extension, selection of affordable and feasible wastewater management solutions.

Key features:

- Automation of gravity-prioritised sewer
- Designed for data-scarce regions
- Well-documented, open-source, "easy-to-use" tool

Optimisation algorithms used in pysewer's development:

- Dijkstra's Algorithm for Shortest Paths
- Breadth-First Search (BFS)
- Minimum Spanning Tree (MST)

The result is a gravity-prioritised sewer network layout ready for preliminary planning and initial cost estimations. Figure 1 summarises pysewer's

Export

Class

Module

geopackage

geoparquet

shapefile

Network optimisation Decision variables include pipe diameters, slopes, and pump penalty—a cost factor used to

quantify the economic impacts of using pumps in the network.

Constraints conisdered by pysewer are the hydraulic capacity (peak flow) and trench depth (t_{min} and t_{max})

	architecture		
Preprocessing of data input & generation of initial graph network	Gravitiy flow prioritised sewer network layout	Gravitiy flow prioritised sewer network layout	
	Routing Solvers	Visualisation & expo	
DEM	RSPH Fast	Plot functions	



Pysewer isn't just a tool; it's a solution designed to meet the urgent needs of modern and sustainable wastewater management. By generating sewer network layout with minimal data and effort, pysewer provides the opportunity to help settlements worldwide achieve efficient, cost-effective

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Reference: Khurelbaatar, G., Al Marzuqi, B., Van Afferden, M., Müller, R. A., & Friesen, J. (2021). Data Reduced Method for Cost Comparison of Wastewater Management Scenarios–Case Study for Two Settlements in Jordan and Oman. Frontiers in Environmental Science, 9 – 2021.