

Simulation of groundwater flow and seawater intrusion in response to climate change and human activities on the coastal aquifer of Gaza Strip, Palestine

Iyad Musallam ¹, Yangxiao Zhou ², and Graham Jewitt ²

¹ Department of Water Resources Development, Water Resources Unit, Water and Environment Quality Authority (WEQA), Gaza, P840–P899, Gaza Strip, Palestine; Email iyadmus@gmail.com

² IHE, Delft Institute for Water Education, The Netherlands

Section S1 Rainfall stations and monthly rainfall from period 2010 to 2019

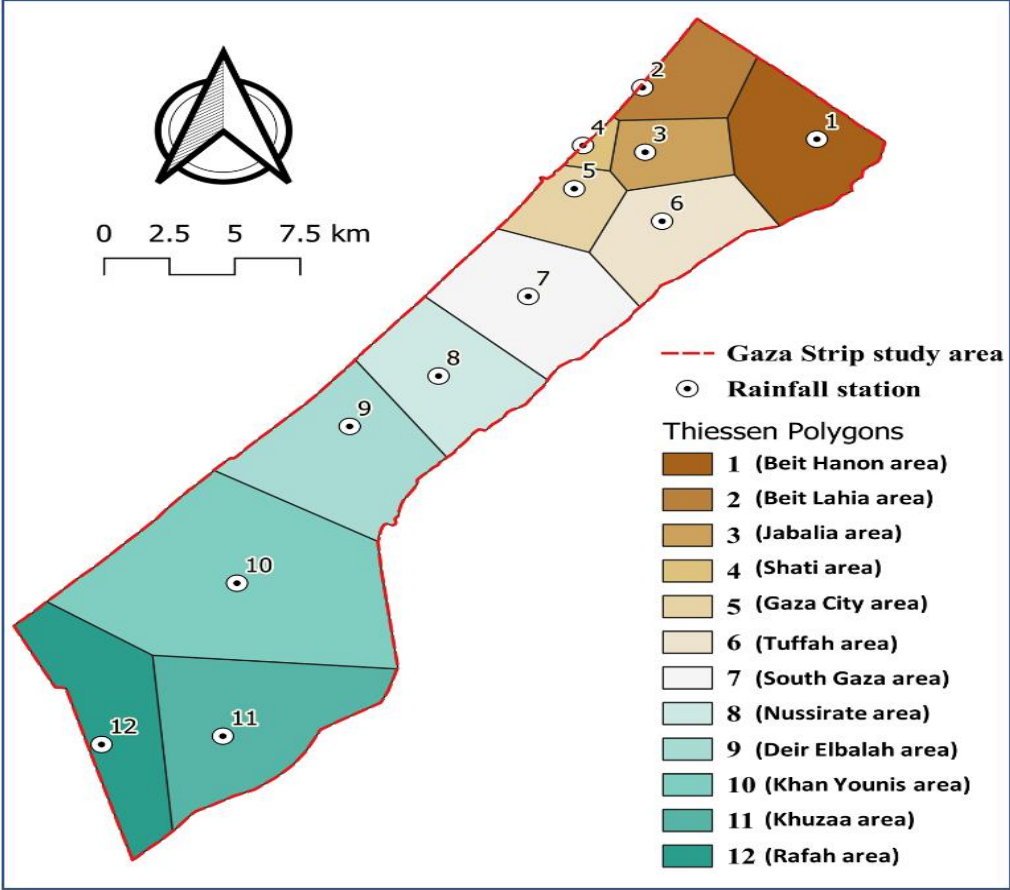


Fig S1 Locations of rainfall gauge stations and Thiessen polygons created with QGIS

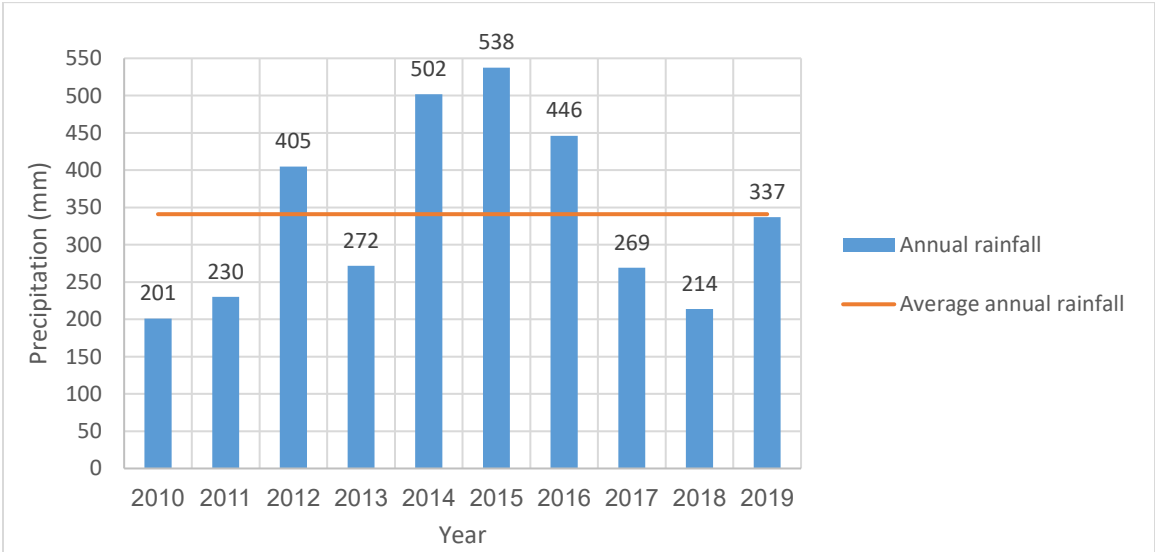


Fig S2 Annual rainfall and average rainfall from period 2010 to 2019

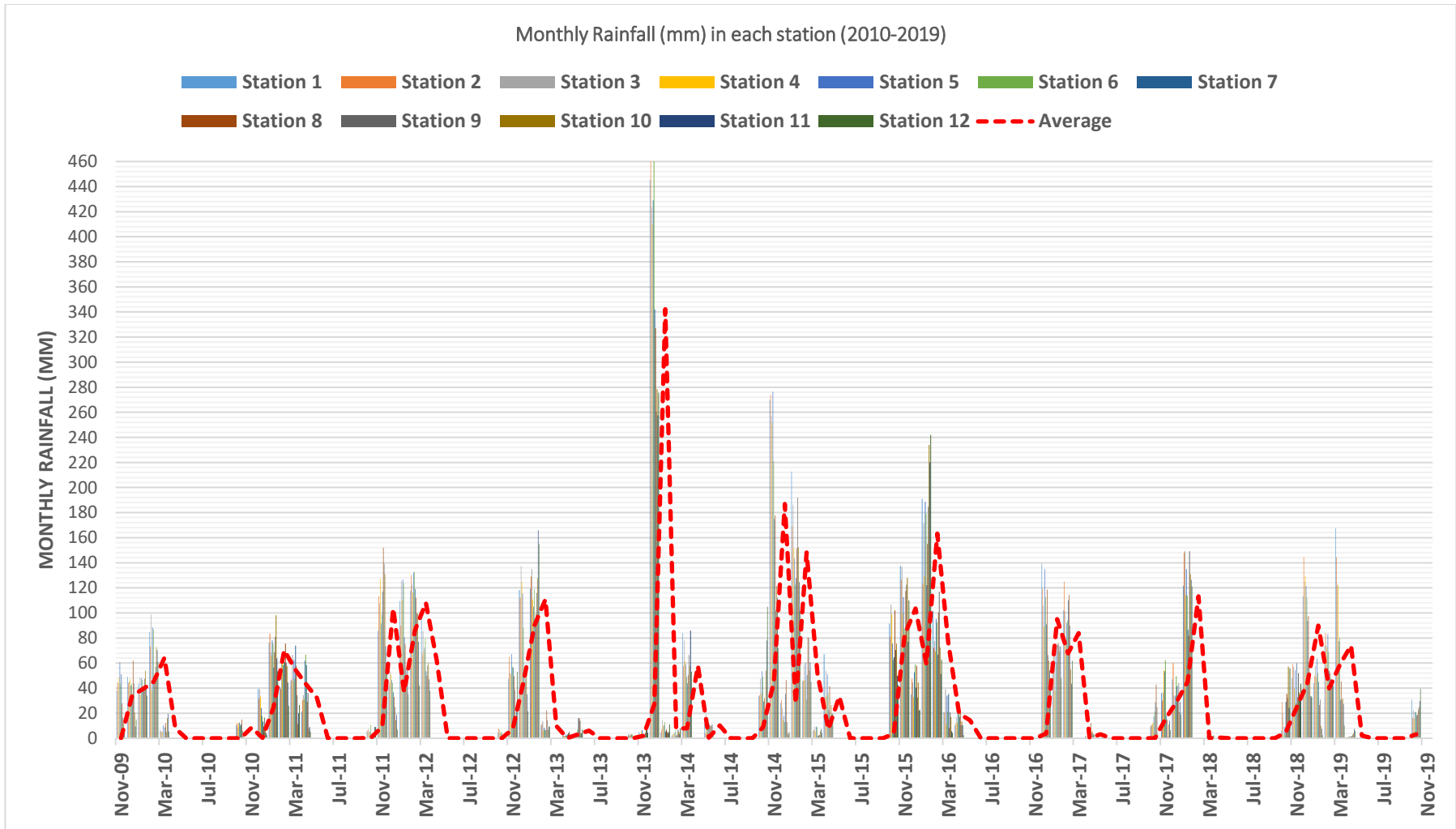


Fig S3 Monthly rainfall at each station from period 2010 to 2019 (PWA 2020)

Section S2 Calibrated parameter values for all model layers

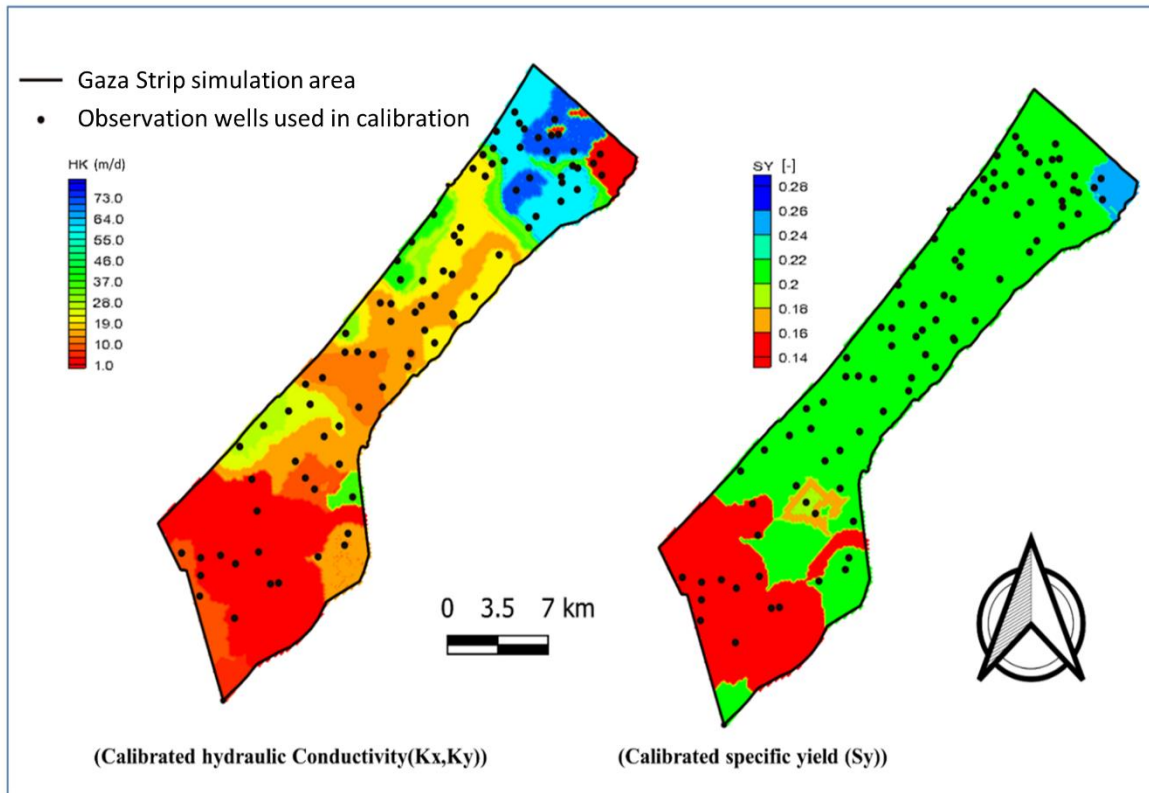


Fig S4 Sub-Aquifer A (layer 1) Calibrated horizontal hydraulic conductivity and specific yield

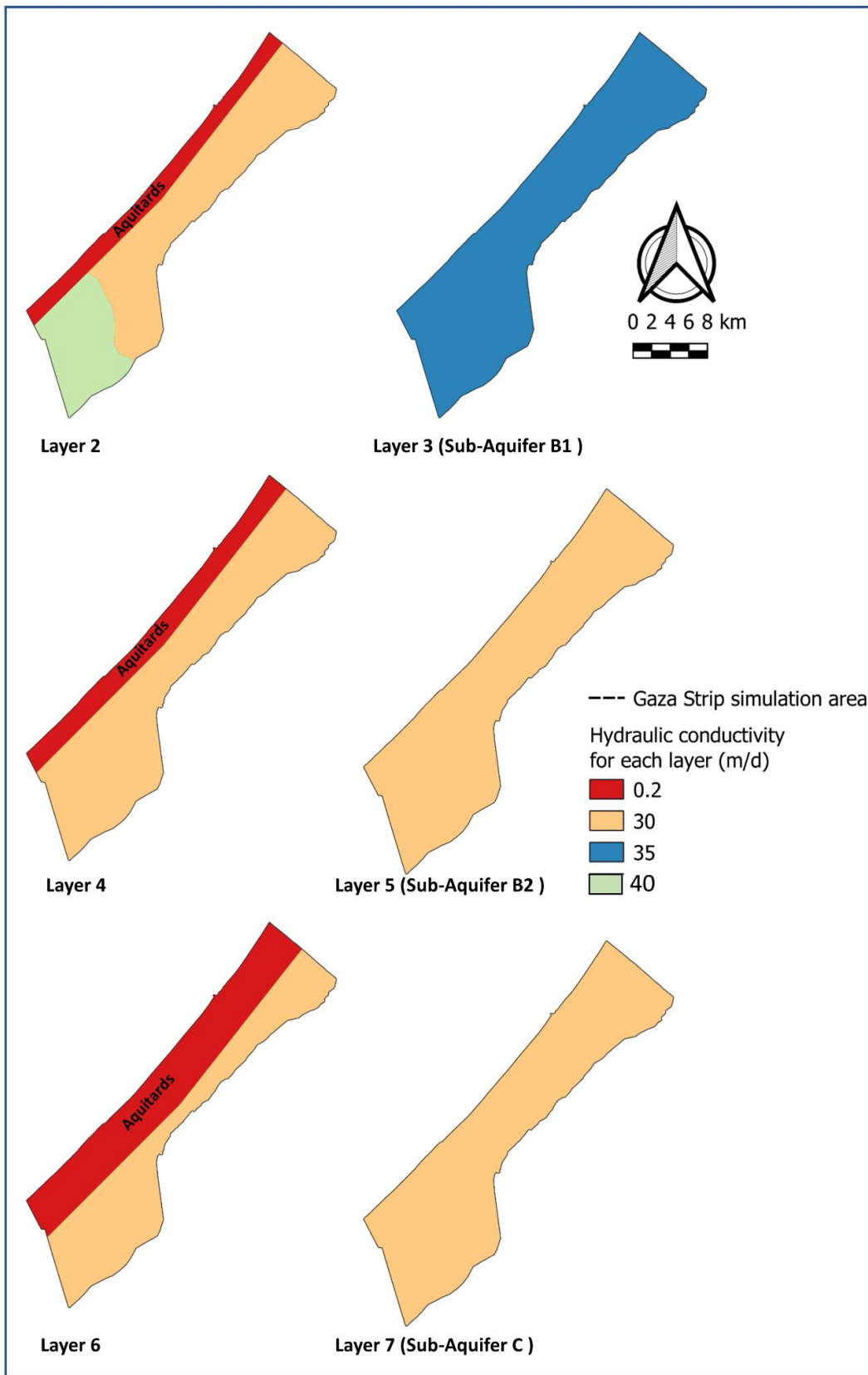


Fig S5 Calibrated horizontal hydraulic conductivity for the sub-aquifers and aquitards (layers 2-7)

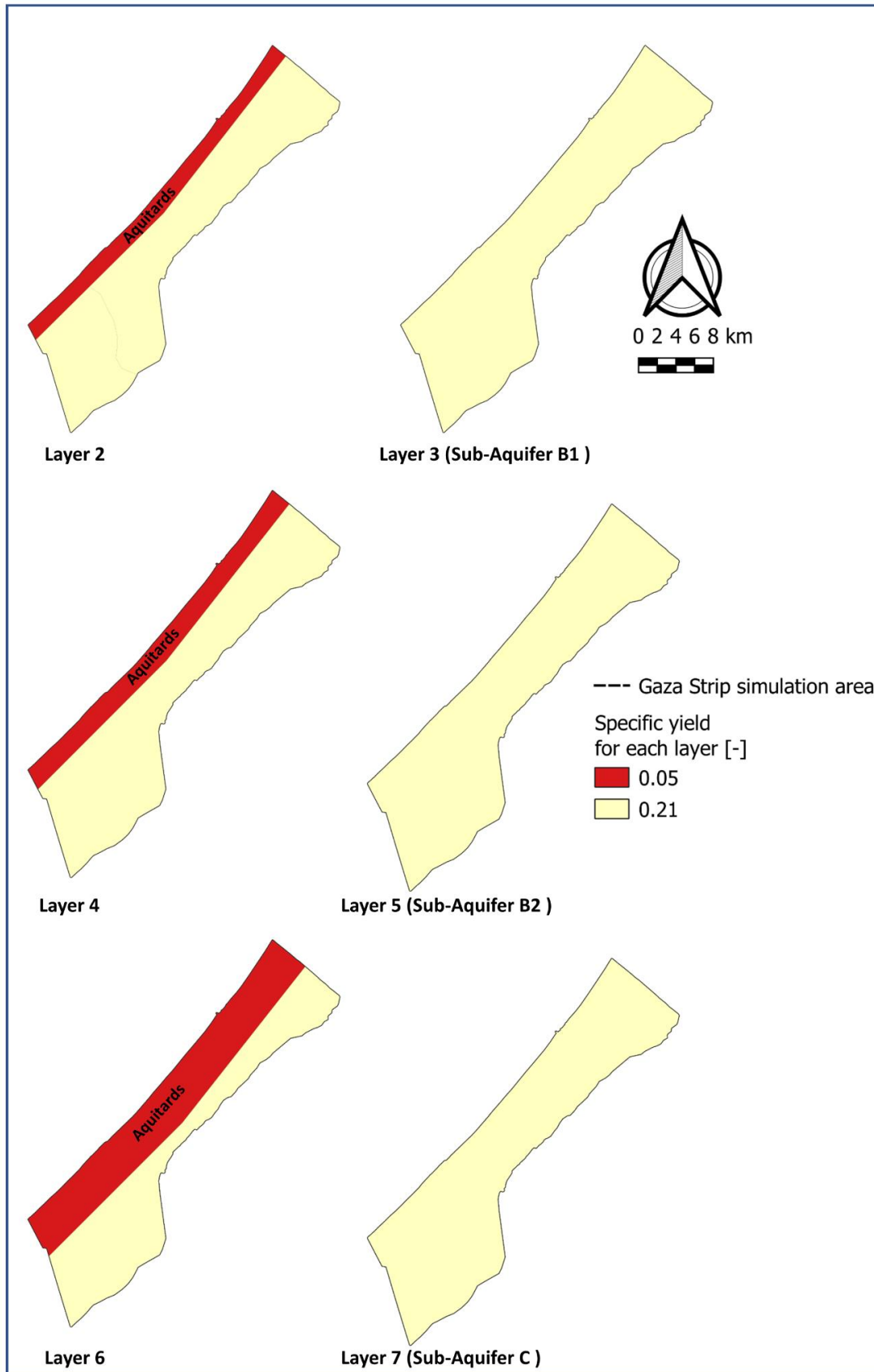


Fig S6 Calibrated specific yield for the sub-aquifers and aquitards (layers 2-7)

Table S1 Sub-Aquifers and aquitards. Calibrated parameters

| Aquifer parameter | Calibrated parameters in this study | |
|------------------------------------------------------|--------------------------------------------|------------------|
| | 85 observation wells | |
| | Sub-aquifers | Aquitards |
| Porosity (all layers) | 0.25 | 0.3 |
| Specific storage, Ss (m ⁻¹) (all layers) | 10 ⁻⁴ | 10 ⁻⁵ |

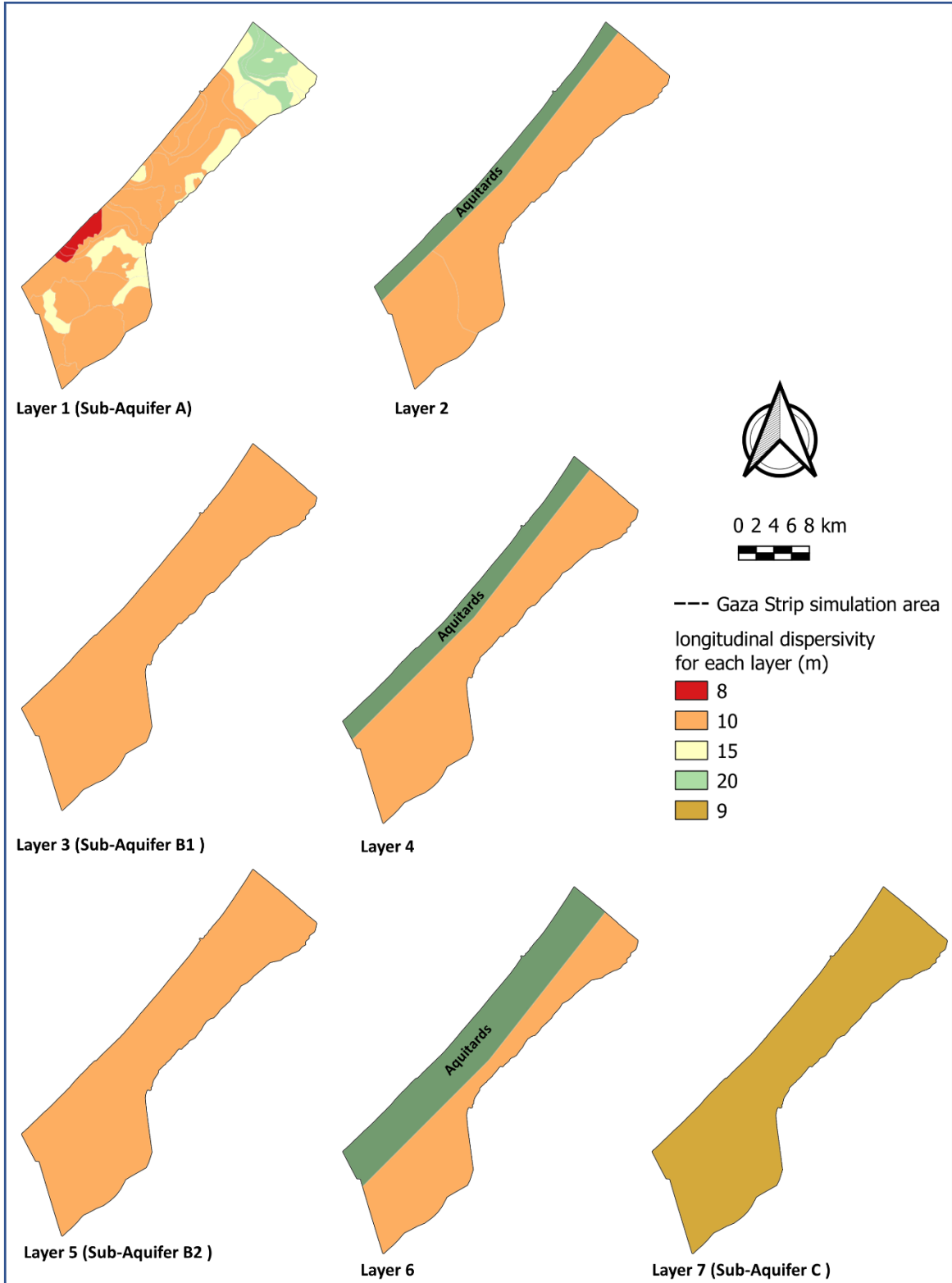


Fig S7 The calibrated longitudinal dispersivity of the sub-aquifers

Table S2 The calibrated longitudinal, horizontal, and vertical transverse dispersivity of the sub-aquifers and aquitards

| Aquifer parameter | Calibrated parameters in this study | |
|--------------------------------------|--------------------------------------------|-----------|
| | 170 observation wells | |
| | Sub-aquifers | Aquitards |
| Longitudinal dispersivity (m) | 8-20 | 6 |
| Horizontal dispersivity (m) | 1-2 | 0.6 |
| Vertical transverse dispersivity (m) | 0.1-0.2 | 0.06 |

Section S3 Estimated monthly rainfall recharge rates in representative areas

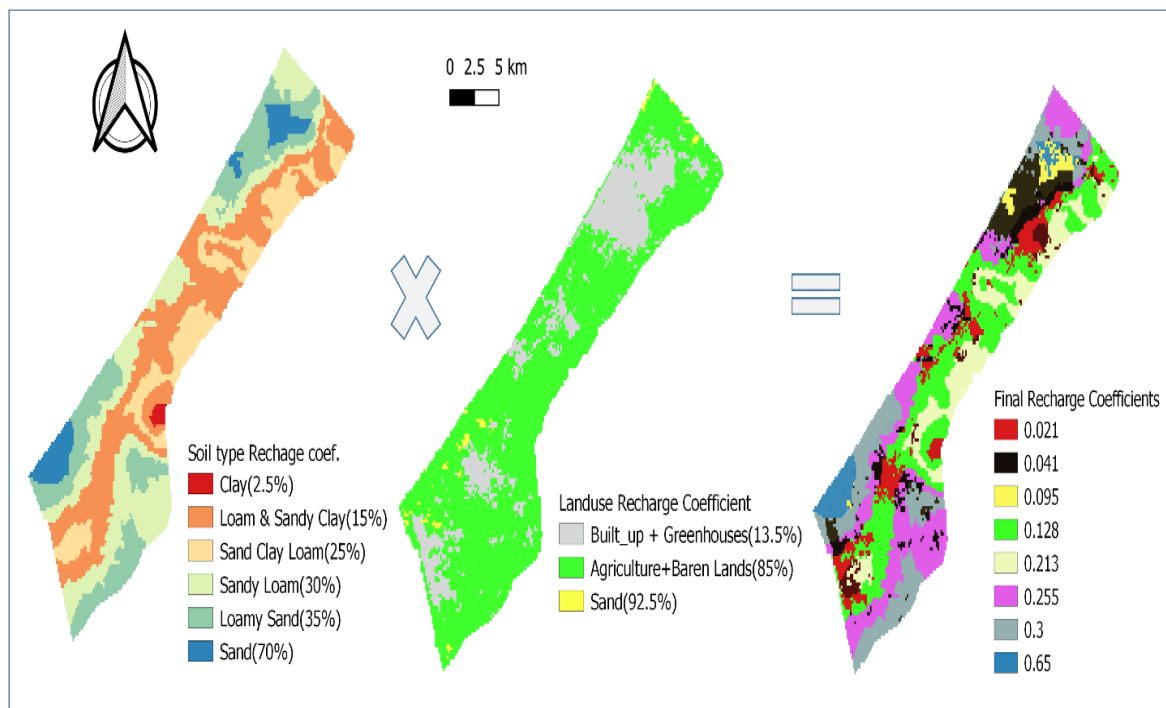


Fig S8 The final aquifer recharge coefficients for period 2015-2019

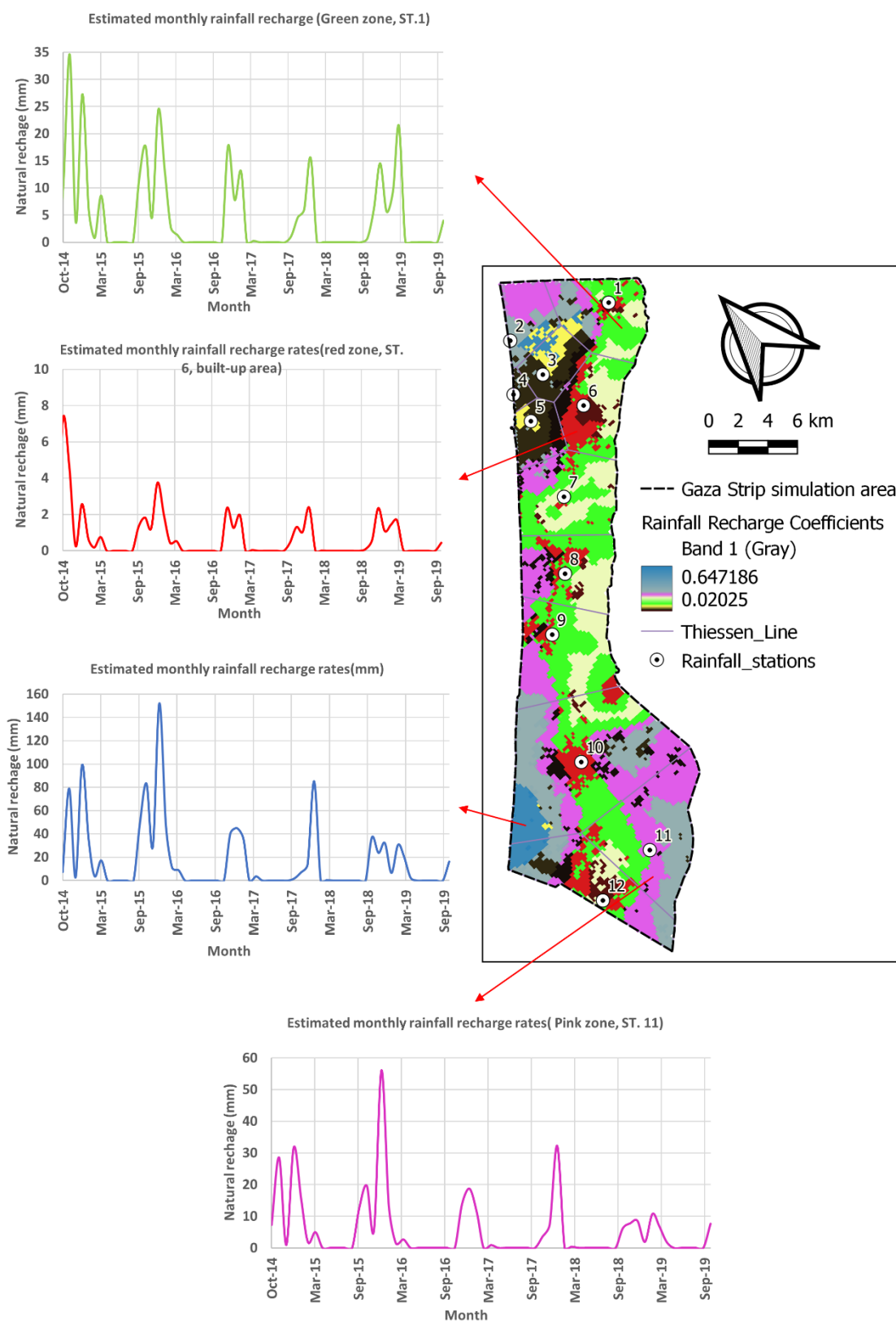


Fig S9 Estimated monthly recharge rates for period 2015-201

Section S4 Monthly leakage rates from water supply and wastewater pipelines for period 2010–2019 based on data from the Palestinian Water Authority (PWA, 2020)

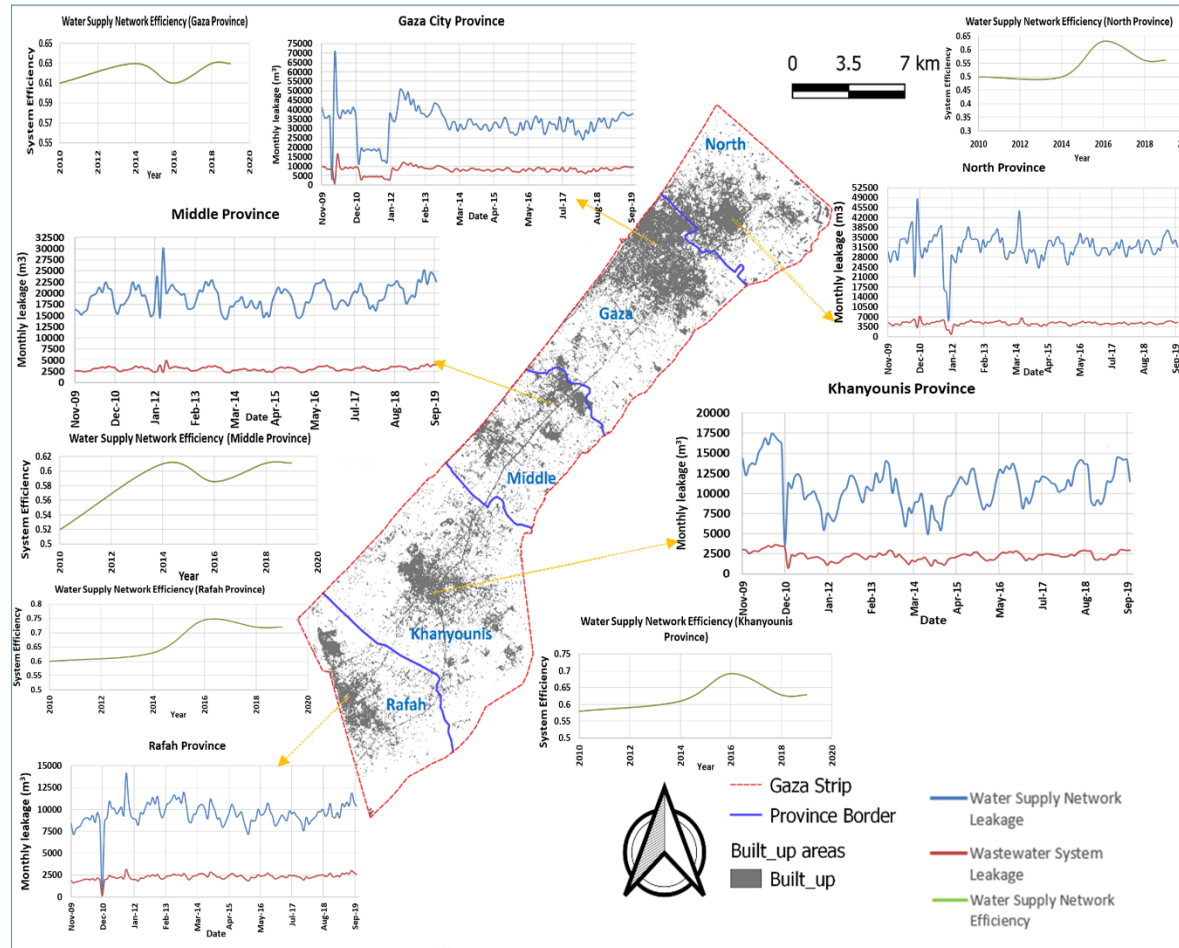


Fig S10 Monthly leakage rates from water supply and wastewater pipelines in period 2010-2019 based on data from PWA (2020)

Section S5 Monthly rates of return flow in every province for period 2010–2019 based on data from the Palestinian Water Authority (PWA, 2020)

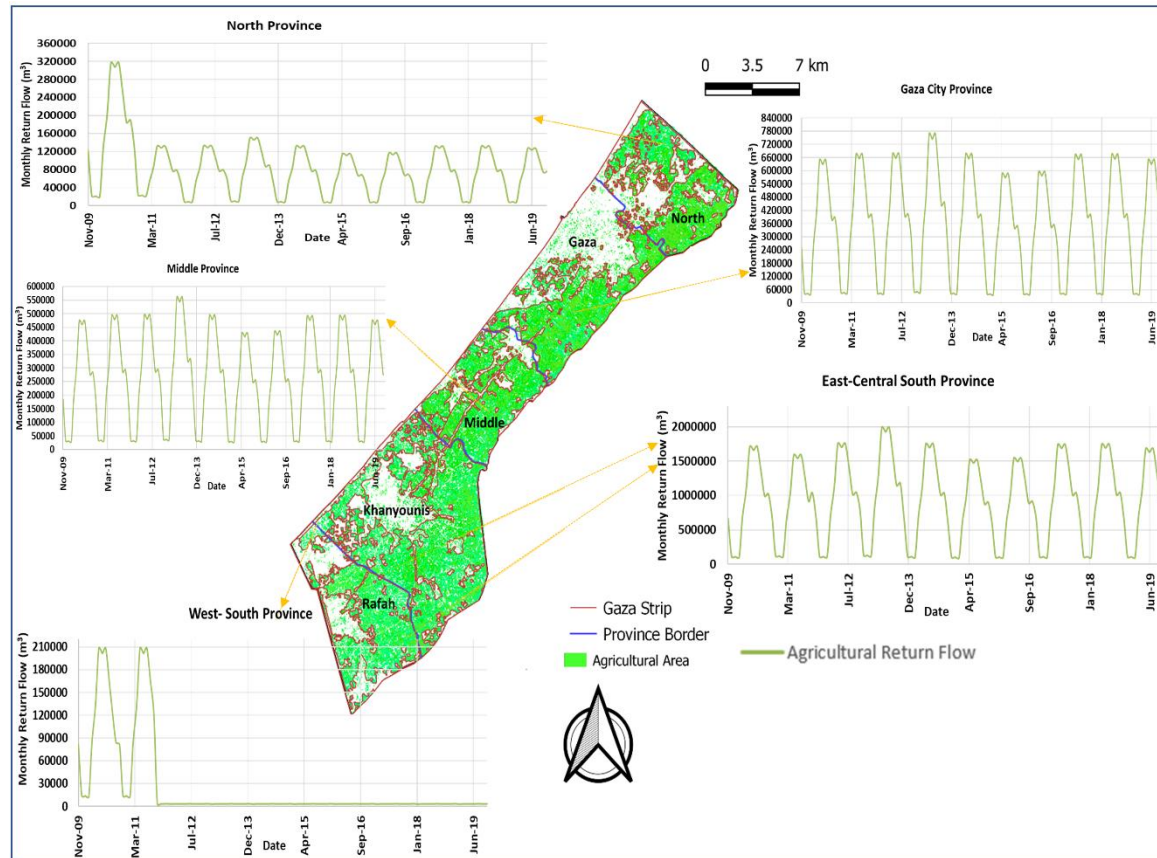


Fig S11 Monthly rates of irrigation return flow in every province in 2010-2019 based on data from PWA (2020)

ESM Reference

PWA (2020) Archived data, Gaza–Palestine, Palestinian Water Authority (Vol. 8, Issue 5),
<http://www.pwa.gov.ps/>.