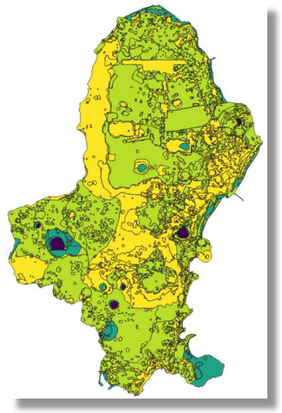
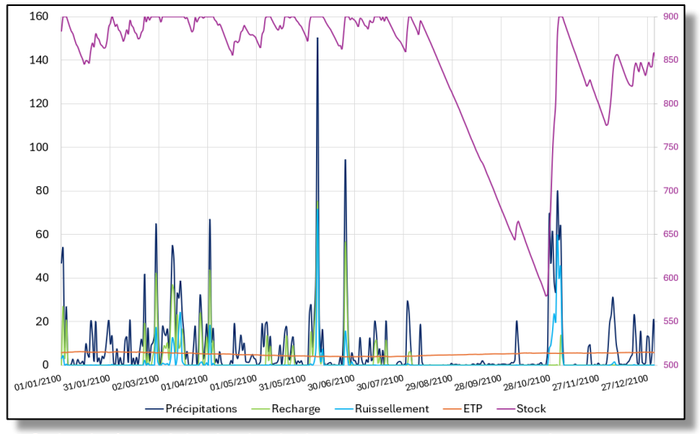
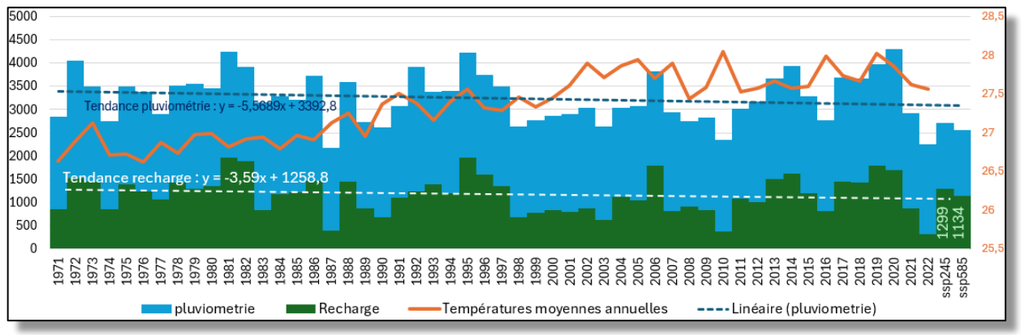
Effects of climate change on the recharge of the freshwater lens on Wallis Island



Characterization of the territory Here: Runoff parameter (SCS Curve Number)



Calculation of the hydro balance parameters over the year 2100 from climate change scenarios, here: CMIP6, ssp585 (worst-case scenario): Period without recharge with stock collapse



Application of the calibrated hydro balance to all the existing weather record: clear decrease in recharge (and decrease in rainfall + very clear increase in temperatures)

Data study

Selection of work periods

Piezometric data | *Weather records*

Water table fluctuation method | Hydro balance method

Definition of key parameters: Drying up, Porosities, Piezometry classes | Definition of key parameters: ETP (Oudin formula), Runoff (SCS method), Stock max

2001-02 1992 | 2001-02 1992

Convergence of results Parameter calibration

Application of the calibrated hydro balance to other datasets (inc.CC)

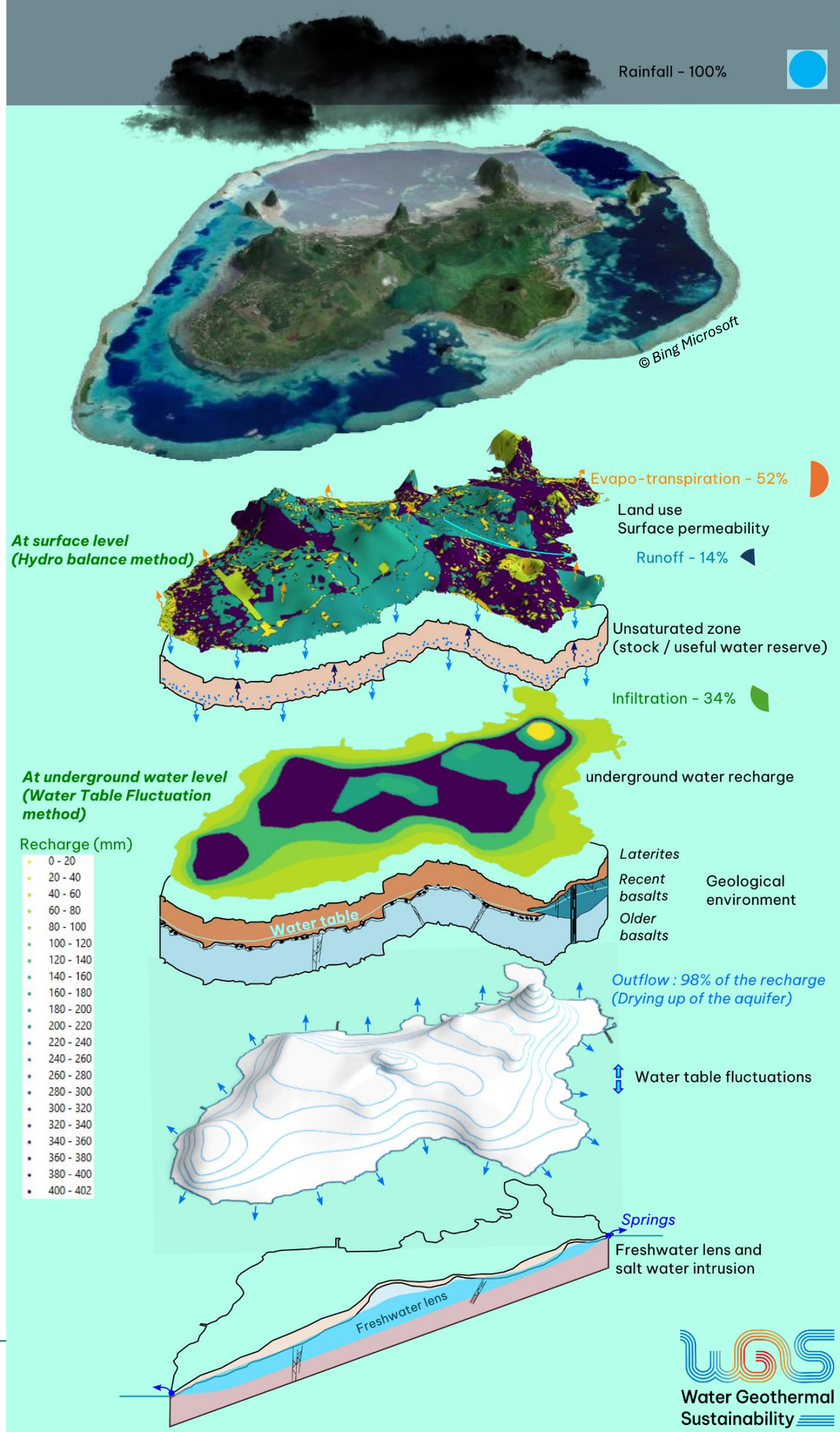
Definition of an original methodology based on existing data

Mean recharge : 89 Mm3/year

- → Study is reproducible to other islands, other datasets
- → The parameters of the hydro balance are applicable to other environmental studies
- → Creating an easy-to-use spreadsheet

	Risk	Probability	Severity	Mitigation measures
1	Lower recharge = quantitative risk	Strong (-25% recharge compared to 2024 according to regression line)	Strong	• Greening, infiltrating valleys, hedges • Runoff control
2	Resource too low for demand = quantitative risk	Moderate (resource that currently uses between 2 and 6% of the recharge, stable demography, rising temperature that pushes to overconsumption of water)	Strong	• Limitation of accessory consumption • Regulation of "uncontrolled" wells/boreholes • Consumption is dependent on the recharge regime during the year • Limitation of farms • Improvement of the distribution network to limit the risk of leaks • Development of a monitoring system with alert thresholds
3	Accentuation of the saltwater intrusion due to more important and too concentrated withdrawals = pumping stopped due to quality deterioration	Moderate (consumption will increase, but the distribution of withdrawals depends heavily on public policies)	Strong	• Better distribution of samples than at present • Selection of potential sites that are not affected by the risk of a salt wedge • Implementation of monitoring (dedicated boreholes equipped with recording probes)
4	Progression of the saltwater intrusion due to the raise of sea level combined to a lower recharge = freshwater lens harder to reach	Moderate (the sea level will rise but the topography is not flat lowering its effect, the recharge will drop)	Strong (Irreversible)	Natural phenomenon with no mitigation measures possible
5	Decline in stock in the unsaturated zone resulting in a less available useful reserve for vegetation and crops	Moderate (depending on climate change scenarios)	Moderate	Agricultural techniques for preserving soil moisture for crops

Risk matrix on resource availability at 2100, combined effect with the salt water intrusion



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