

RESEARCH BRIEF

Climate-zone effects on decay risk — model vs field trials

How the Wood Intelligence model translates Köppen climate classes into decay hazard, and how those model outputs compare with the 24-case WI-VAL benchmark. Includes leave-one-out accuracy and known failure modes.

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Method	WI-SL v1.2.0 / WI-CAL v1.1.0
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Key takeaways

- The model uses five climate drivers (UV, driving rain, humidity, chloride, freeze-thaw) normalised per Köppen zone.
- Tropical (A) and arid (B) zones carry the highest calibration uncertainty because the benchmark contains fewer completed observations.
- Leave-one-out validation shows a mean absolute error of 4.8 years and 83% interval coverage after calibration.

Five drivers, one decay hazard

Decay risk is not only rainfall. The model combines UV exposure, driving rain, airborne salt, relative-humidity load and freeze-thaw cycles into a single climate-load index. Each driver is normalised to a 0-100 scale using ERA5 monthly reanalysis and Köppen-Geiger class boundaries. The index is then applied as a multiplier on the species base life.

Validation approach

WI-VAL v1.1.0 contains 24 empirical cases: outdoor exposure trials, in-service surveys, standardised tests and service-life databases. Each case records observed service life, species, treatment state, orientation and climate. The model is first run uncalibrated, then a log-space multiplicative bias correction (WI-CAL v1.1.0) is fitted and applied. Leave-one-out cross-validation is used to estimate out-of-sample error.

Known limitations

- Tropical and arid zones are under-represented in the benchmark; predictions there should be treated as model estimates with wider uncertainty bands.
- The model does not yet account for local microclimate (overhangs, proximity to soil, ventilation gaps below 10 mm).
- Treatment efficacy is parameterised by maintenance interval; site-specific coating performance may differ.

Sources

- WI-SL v1.2.0 method equations
- WI-CAL v1.1.0 calibration factors
- WI-VAL v1.1.0 24-case benchmark
- ERA5 / Copernicus climate reanalysis

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