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**An environmental flow determination method for integrating multiple-scale ecohydrological and complex ecosystem processes in estuaries**

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**ABSTRACT:**

This paper presents an environmental flow methodology that was developed to accommodate shallow, highly dynamic micro-tidal estuaries found along the wave-dominated coast of South Africa. This method differs to most other approaches that primarily focus on larger permanently open systems having unrestricted inlets. Following an adaptive, design science research approach, the 7-step method adopted both ecohydrological and ecosystem-based concepts, encapsulating key hydrologicalhydrodynamic-biogeochemical processes, as well as biotic responses. The procedure also addresses a key challenge often encountered in applying these approaches to complex estuarine systems - the mismatch of temporal and spatial scales between abiotic processes and biotic responses. The method simplifies and aggregates abiotic processes to appropriate scales suitable for analysis of biotic responses, by introducing concepts such zoning and major physical states that characterize an estuary. The method's flexibility in data requirements lends itself to applications in countries where data is limited or where differences exist in data quality between systems. Essential in any environmental flow determination process, however, is long-term monitoring to incrementally improve confidence of the input data, but also to evaluate whether allocated flows achieve desired objectives set. Future challenges include refining the method to accommodate flow changes within much shorter timeframes and in conjunction with escalating global change pressures amongst other; pollution, living resource exploitation and physical destruction of habitat.