



## **Designing a ‘safe and just operating space’ for the Chilika lagoon fishery of the Mahanadi delta, India**

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Annual fish production from the Chilika lagoon is worth US\$25-million/year, underpinning the livelihoods of 35,000 fishers and 200,000 secondary dependants. The system has a legacy of collapse, transitioning from annual production rates of 9000 tonnes to 1300 tonnes during the late-1980s, with resulting livelihood losses triggering the first recorded instances of economic migration from Chilika. Despite engineered recovery since 2000, the future persistence of Chilika’s resource stock is uncertain. Climate change may strengthen freshwater and sediment delivery, promoting ecohydrological degradation through tidal outlet sedimentation, reduced salinity and freshwater weed growth. Simultaneously, human population growth, fleet motorisation and consumption demands threaten overexploitation driven collapse. These critical social-ecological drivers and feedbacks are projected into future by integrating system dynamics modelling with Monte Carlo inputs. Sustainable pathways are identified from outputs producing social-ecologically desirable futures, such as mid-century catch equalling maximum sustainable yield. The ‘safe and just operating space’ metaphor is regionalised by the limits of sustainable trajectories, such as the permissible number of active fishers, motorised boats and juvenile catch under alternative governance scenarios. These critical thresholds suggest policy-relevant guardrails for the sustainable governance of Chilika, in order to avoid regional productivity collapse, ecological degradation and livelihood losses. Benefits and trade-offs of alternative governance approaches are also discussed, aiding the optimisation of future regulatory decision-making.