

Environmental externalities and freshwater reforms - Can we really manage whole catchments?

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Abstract

New Zealand has a long history of promoting catchment- based management. “Integrated catchment management taking into account connections with coastal water bodies” is a requirement if the NPS-FM 2014. Effective, whole-catchment management is very challenging and, we suggest, rarely achieved. This talk explores the issue of the negative environmental externalities of land use and the implications of dealing with these at whole catchment scales particularly where downstream water bodies such as sensitive coastal ecosystems occur. We address four questions:

1. How do we characterize the negative externalities of intensive land use at whole-catchment scales?
2. Is Regional catchment planning and management sufficiently advanced to deal effectively with land-use externalities?
3. Can our current freshwater reforms cope with land-use externalities?
4. What science is needed to inform whole-catchment management?

In addressing these questions, we propose some guiding principles and associated science needs that include:

- Whole catchments include terminal water bodies (endorheic lakes, estuaries and coastal zones).
- Externalities increase in number with distance downstream, and increase as catchment size increases; interactions among externalities (e.g., multiple stressors) also increase in number and complexity with distance downstream and increasing catchment size.

- Characteristic times for externality emergence, effect and recovery increase with catchment size; values may change within long frames.
- Whole catchments can only be managed by setting limits on land-use pressures and these can only be set with an understanding of catchment-scale attenuation.
- Catchment residence time has contrasting implications; in some cases increasing residence time leads to greater attenuation of pressures and in others it leads to greater accumulation.
- At whole catchment scales the difficulty in managing land-use pressures increases with distance from the source
- To be effective, catchment management and the underpinning science needs to account for longitudinal and network variation, and for conditions in each of the linked components of whole catchments.
- Understanding “Critical Points” will provide early options for effective catchment management