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Wastewater reuse in agriculture: Methodological issues

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Our group

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The main goal of our group is to improve management practices (water and soil) in agriculture.

Sound application of engineering sciences in agriculture:

- development of soil nutrient budget in dairy and pig farms,
- development of treatment technologies for agriculture-related wastewater,
- development of environmental risk analysis methodologies, and
- advanced modeling of water and solute transport.

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- Chilean agriculture strongly relies on irrigation. Increasing demand of water for irrigation.
- Wastewater reuse is an attractive option for agricultural production: increasing security (controlling risks).
- Potential use of wastewater as a Non-conventional water resource in selected locations in Chile, part of a national-level study developed for the National Irrigation Commission (Comisión Nacional de Riego CNR).
- Literature survey: more than 200 documents (technical reports from governmental agencies worldwide, journal articles, among others) to gain insight regarding the definition of reuse schemes.
- Focused on technical, economical, legal and environmental issues, and analysis of published reuse schemes.

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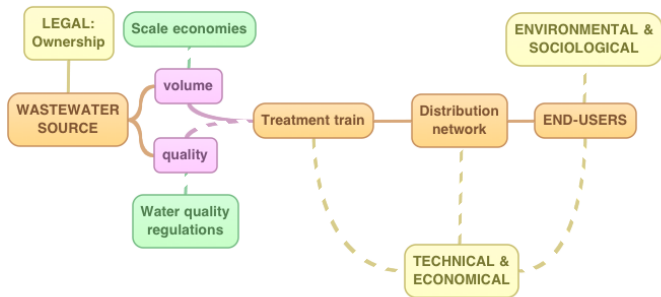
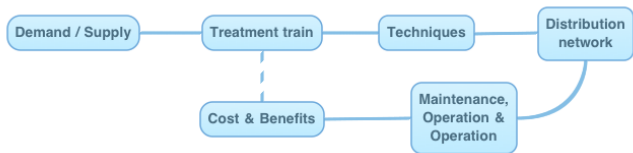
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- Treated municipal wastewater: 85 % (2007) 98 % (2018). Highly atomized, usually far from agricultural lands.
- Industrial Wastewater: Regulated since 2002, small volumes and/or with final disposition.
- DS 90 regulates discharge over surface waters. NCh1333 regulates water quality used for irrigation.
- Nutrients, metals, emergent pollutants.

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Technical & Economical

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- Performance of water reuse schemes strongly depends on the performance of the treatment plant (source): monitoring.
- Location, Volume, Ownership. Treatment plant for 10000 hab (250 L hab⁻¹ d⁻¹) would supply annual water for ca. 100 ha.
- Not always the optimal location or design: externalities.

Environmental

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- Effects on soils, crops, groundwater systems, public health, workers' health.
- Nutrients, (heavy) metals, microbiological load, odors, physical parameters: monitoring.

Legal

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- Wastewater reuse regulated by diverse laws (including the Constitution)
- Main issue is ownership of treated wastewater: selling or renting. Price.

Concluding remarks

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- The location, design and operation of reuse schemes is site specific. The design of unit operations for treatment are well-known.
- The treatment train, in most cases, is constrained by economical aspects.
- The successful operation of reuse schemes requires the commitment and involvement of end-users.
- It is necessary to define institutional frameworks and long-term policies to encourage the implementation of reuse schemes.
- *Ex post* assessments: monitoring phase for reuse schemes, in order to control potential impacts (direct and indirect): Who pays?

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