

The relationship between intragenerational and intergenerational justice in the use of ecosystems and their services.

Long abstract:

Realizing a sustainable use and conservation of ecosystems and their services is a major challenge for human society (MEA 2005, TEEB 2010a, UN/DESA 1992, UNEP 2012). Its implementation in global, national and local sustainability policy demands to account for the variety of ecosystem services: They can be provisioning, regulating, cultural or supporting services; substitutable and non-substitutable by human-made goods and services; excludable or non-excludable from use; consumptive or non-consumptive; rival or non-rival in consumption. Intragenerational trade-offs in the provision of different ecosystem services by one renewable resource stock (e.g. between wood provision and recreational services provided by a forest), as well as intergenerational trade-offs between the consumption of ecosystem services by today's persons and the conservation of renewable resource stocks for future persons (e.g. between present provision of agricultural goods and the maintenance of fertile soils for future agricultural production) may occur (cf. TEEB 2010b: 81ff.). These potential trade-offs ask for careful recognition of the underlying linkages between renewable resource stocks and ecosystem services. The societal objective of sustainability in the use of ecosystem services refers to two different justices of equal normative rank: intragenerational justice and intergenerational justice. In the design and implementation of sustainability policy, these two justices potentially conflict. Generally, three relationships in the attainment of the two justices ('justice-relationships') occur in real-world contexts (Glotzbach and Baumgärtner 2012):

Generally, three relationships in the attainment of the two justices ('justice-relationships') occur in real-world contexts:

1. **Independency:** The objectives of intra- and intergenerational environmental justice can be achieved independently, that is, attaining one objective to a higher degree does not necessitate any change in the degree of attainment of the other objective.
2. **Facilitation:** Achieving one objective of environmental justice supports achieving the other one, that is, attaining one objective to a higher degree induces a higher degree of attainment of the other objective.
3. **Rivalry:** A fundamental rivalry ("trade-off") exists between the objectives of intra- and intergenerational environmental justice, that is, attaining one objective to a higher degree necessarily reduces the degree of attainment of the other objective.

Although considerable research has studied problems of intergenerational justice in renewable resource use (specifically under the maximin-criterion in the spirit of Rawls' second principle of justice, e.g. Cairns and Tian 2010, Martinet 2007), rather less attention has been paid to simultaneous investigation of intragenerational and intergenerational problems in renewable resource use (cf. e.g. Roemer and Veneziani 2007). In this paper, we aim for a systematic investigation of the 'justice-relationship' against the backdrop of given

societal circumstances, focusing on environmental justice – that is, justice in the distribution of access rights to ecosystem services (Sievers-Glotzbach 2013).

In the two-period model, individuals maximize their utility from a manufactured consumption good and two ecosystem services delivered by a renewable resource stock, a consumptive and a non-consumptive ecosystem service. The policy instrument (instrument of justice) is the assignment of first- and second-generation utilization rights to the renewable resource stock by a social planner. The given societal circumstances are depicted by certain system determinants: the quantity of ecosystem services (i.e. the total endowment with the renewable resource stock and its intrinsic growth rate), the quality of ecosystem services (consumptivity, rivalry in consumption and excludability from consumption), population development, substitutability of ecosystem services (both between manufactured-good consumption and aggregate ecosystem-service consumption, and between a consumptive and a non-consumptive ecosystem service), technological progress (in the manufacturing sector and in resource harvesting), and political restrictions on the assignment of resource utilization rights. The degree of intragenerational (resp.: intergenerational) justice in ecosystem-service use is measured in terms of the Rawlsian Difference Principle regarding the individual utilities attained by the first-generation individuals (resp.: the first- and second-generation individuals).

With this model, we numerically simulate how different assignments of resource utilization rights to potential ecosystem users give rise to different combinations in the degree of attainment of intra- and intergenerational justice ('justice opportunity set').

The contribution of this paper is twofold: First, it systematically represents the main elements of the 'justice-relationship' and their interactions in an ecological-economic model – including the societal circumstances of the 'justice-relationship' and a differentiated description of ecosystem services (i.e. regarding mode of production, substitutability, excludability from use, consumptivity and rivalry in consumption). Second, this model provides a tool to systematically analyze the interdependencies between the objectives of intragenerational and intergenerational justice in ecosystem use.

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