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Co-viability modelling for the sustainable management of biodiversity.

A basic issue for a sustainable management of renewable resources is the reconciliation of ecological and economic requirements with an intergenerational equity perspective. The presence of numerous uncertainties in the systems at stake complexifies such a goal. Stochastic and robust viability and more generally viable control under uncertainty is proposed here as a relevant modeling framework to deal with such issues. Such an approach does not strive to determine optimal or steady-state paths for the joint dynamics of resources and exploitations, but rather aims at maintaining the trajectories of systems within satisfying normative bounds that mix ecological, economic and social requirements. Hence the approach offers a multi-criteria perspective and provides ways to analyze and control the risks and vulnerability of bio-economic systems. Conceptual links to Population Viability Analysis (PVA) and maximin or Rawlsian approach are shown. It can also be proved how a dynamic programming structure underlies such a viability approach. Examples inspired by the management of biodiversity in agriculture or fisheries illustrate the general ideas. (Received September 09, 2011)