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# Value Index, a Novel Decision Making Approach for Waste Load Allocation

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**Abstract :** Waste load allocation (WLA) policies may use multi-objective optimization methods to find the most appropriate and sustainable solutions. These usually intend to simultaneously minimize two criteria, total abatement costs (TC) and environmental violations (EV). If other criteria, such as inequity, need for minimization as well, it requires introducing more binary optimizations through different scenarios. In order to reduce the calculation steps, this study presents value index as an innovative decision making approach. Since the value index contains both the environmental violation and treatment costs, it can be maximized simultaneously with the equity index. It implies that the definition of different scenarios for environmental violations is no longer required. Furthermore, the solution is not necessarily the point with minimized total costs or environmental violations. This idea is testified for Haraz River, in north of Iran. Here, the dissolved oxygen (DO) level of river is simulated by Streeter-Phelps equation in MATLAB software. The WLA is determined for fish farms using multi-objective particle swarm optimization (MOPSO) in two scenarios. At first, the trade-off curves of TC-EV and TC-Inequity are plotted separately as the conventional approach. In the second, the Value-Equity curve is derived. The comparative results show that the solutions are in a similar range of inequity with lower total costs. This is due to the freedom of environmental violation attained in value index. As a result, the conventional approach can well be replaced by the value index particularly for problems optimizing these objectives. This reduces the process to achieve the best solutions and may find better classification for scenario definition. It is also concluded that decision makers are better to focus on value index and weighting its contents to find the most sustainable alternatives based on their requirements.

**Keywords :** waste load allocation (WLA), value index, multi objective particle swarm optimization (MOPSO), Haraz River, equity

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