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Carbon and Nitrogen Mass Balance in Some Landfill Models for Sustainability Assessment

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"Sustainability" idea is present in the history of the humanity since its origin. In 1987 World Commission on Environment and Development defined "Sustainable Development" as a development "which meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Waste and landfill problems should be managed keeping in mind this concept. Current regulations in Europe set in at least 30 years the duration of the aftercare of a municipal solid waste landfill. But actual sequences of operative management of a landfill and waterproof coverage commanded by the same regulations do not guarantee to reach limits fixed by the law regarding environmental emissions within this period of time. Concept of "sustainability" of a landfill concerns exactly this subject: it's not morally acceptable to leave to future generations a high pollution potential site, without economic coverage to manage it. Therefore we need to reach acceptable impact within the period of assured economic coverage.

Current lawmaker approach fixes aftercare period length instead, ignoring that actually used management techniques don't guarantee at all that this period is enough, with the consequence to leave a contaminated soil to the future generations. In this point of view, mass balance can be a suitable tool for studying long term emissions. It can be applied in small scale to different landfill models, then obtained results can be used in real scale evaluations.

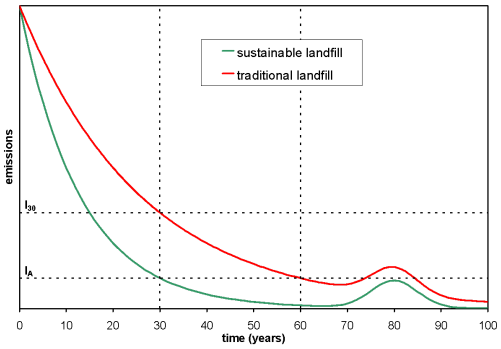

Figure 1. Comparison between the sustainable landfill model (tolerable emission within 30 years) and a traditional landfill scenario

Table 1. Generation of MSW

Year	Generation (tons/day)	Generation Rate (kg/capita/day)
2004	495	0.432
2005	520	0.456
2006	545	0.467

Mass balance seems to be a very useful tool to evaluate long term impact of a waste landfill. Together we tabbed removal and transformation percentages concerning carbon and nitrogen in the four columns used for the tests.