VETIVER SYSTEM FOR LANDFILL LEACHATE CONTROL

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Due to its high level of tolerance to extreme conditions including heavy metals toxicities, vetiver grass has been used very successfully in the treatment of leachate from landfill sites in Australia,China and Thailand.

OLD LANDFILL IN AUSTRALIA

Due to the high level of heavy metals, this 25 year old landfill near Brisbane remained bare of vegetation and produce excessive leachate after rain

Leachate runoff drained to local streams, polluted local environment

Vetiver was planted to soak up this highly contaminated leachate

Excellent growth unaffected by the acidic and elevated level of heavy metal, particularly chromium in the leachate

Threshold levels of heavy metals to vetiver growth as compared with other species

Heavy Metals	Threshold levels in soil (mgKg-1)		Threshold levels in plant (mgKg-1)	
	Vetiver	Other Plants	Vetiver	Other Plants
Arsenic	100 - 250	2.0	21- 72	1 – 10
Cadmium	20 - 60	1.5	45 – 48	5 – 20
Copper	50 - 100	Not Available	13 – 15	15
Chromium	200 - 600	Not Available	5 – 18	0.02 – 0.20
Lead	> 1 500	Not Available	> 78	Not Available
Mercury	> 6	Not Available	> 0.12	Not Available
Nickel	100	7 – 10	347	10 – 30
Selenium	> 74	2 –14	> 11	Not Available
Zinc	> 750	Not Available	880	Not Available

Removal rates of pollutants from landfill leachate

Pollutants		High concentration leachate	Low concentration leachate
COD	Reduction %	69.0	61.9
Carbonate +Bicarbonate	Reduction %	80.6	59.0
Total N	Reduction %	79.4	71.10
	Removal (mg/pot)	232.1	255.4
Total P	Reduction %	70.0	65.0
	Removal (mg/pot)	7.63	4.66
Chloride	Reduction %	21.5	7.9
	Removal (mg/pot)	321.9	207.8

NEW LANDFILL IN AUSTRALIA

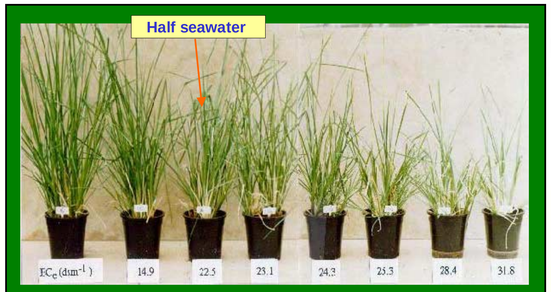
Vetiver planted to intercept leachate from this landfill running into the nearby stream

Despite heavy rain this vetiver planting has completely dried up the leachate

NEW LANDFILL IN THAILAND

Vetiver panted to reduce leachate from this landfill in Bangkok.

Even at this early stage, the leachate level was lowered



Vetiver has saline threshold level at ECse = 8 dSm^{-1} and survives ECse = 47.5 dSm^{-1}. Sea water has Ecse at about 45 dSm^{-1}

NEW LANDFILL IN CHINA

In Guangzhou leachate and odour from this new landfill pollute the surrounding environment if not properly rehabilitated.

Following capping with a thin layer of topsoil Vetiver was planted on top of this landfill.

One year after planting the landfill was successfully rehabilitated.

OLD LANDFILL IN CHINA

Datianshan Landfill of Guangzhou City.

Vetiver was planted on this 100m long and 75m high dam wall to stabilise the dam and to absorb leachate from this 23ha landfill

Excellent growth on leachate reaching over 2m after 6 months

With high water use rate and tolerant to contaminants, Vetiver has dried up leachate completely. Note the dry catch drain

Vetiver growing around the edge of this highly contaminated leachate pond