

4.	<i>Detergent builder system production</i>	37
4.1	Introduction and overview	37
4.2	Context review: The production economy	37
	4.2.1 <i>The production economy</i>	37
	4.2.2 <i>Environmental impact</i>	37
	4.2.3 <i>Economic impact</i>	40
4.3	Key detergent builder system impacts	40
	4.3.1 <i>General considerations</i>	40
	4.3.2 <i>STPP</i>	42
	4.3.3 <i>Zeolite A</i>	46
	4.3.4 <i>Zeolite A and polycarboxylates</i>	50
	4.3.5 <i>NTA</i>	53
4.4	Comparative analysis	55
4.5	Improvement analysis	57
5.	<i>Wastewater treatment and the hydrosphere</i>	59
5.1	Introduction and overview	59
5.2	Context review: Wastewater treatment and the hydrosphere in the EU	59
	5.2.1 <i>Wastewater treatment and the hydrosphere</i>	59
	5.2.2 <i>Environmental impact</i>	61
	5.2.3 <i>Economic impact</i>	62
	5.2.4 <i>Trends in the European Union</i>	65
5.3	Key detergent builder system impacts	70
	5.3.1 <i>General considerations</i>	70
	5.3.2 <i>STPP</i>	72
	5.3.3 <i>Zeolite A</i>	76
	5.3.4 <i>Zeolite A and polycarboxylates</i>	80
	5.3.5 <i>NTA</i>	83
5.4	Comparative analysis	87
5.5	Improvement analysis	89
6.	<i>Sludge management and the environment</i>	91
6.1	Introduction and overview	91
6.2	Context review: Sludge management and the environment in the EU	91
	6.2.1 <i>Sludge management and the environment</i>	91
	6.2.2 <i>Environmental impact</i>	94
	6.2.3 <i>Economic impact</i>	100
	6.2.4 <i>Trends in the European Union</i>	104

6.3	Key detergent builder system impacts	107
6.3.1	<i>General considerations</i>	107
6.3.2	<i>STPP</i>	108
6.3.3	<i>Zeolite A</i>	111
6.3.4	<i>Zeolite A and polycarboxylates</i>	113
6.3.5	<i>NTA</i>	116
6.4	Comparative analysis	117
6.5	Improvement analysis	119
7.	<i>LIFE CYCLE REVIEW</i>	121
7.1	Introduction and overview	121
7.2	Environmental impact: Comparative analysis	121
7.3	Economic impact: Comparative analysis	123
7.4	Improvement analysis	124
	<i>REFERENCES</i>	127
	<i>ANNEX A: BASIC COUNTRY INFORMATION</i>	153

## List of tables

No.	Table title	page
2.1	European Union environmental policy summary.	5
2.2	Key detergent builder systems.	7
2.3	Impact of detergent builders: Key assessment criteria.	9
3.1	Key detergent components in Western Europe.	13
3.2	Key indicators of the environmental impact of textile cleaning in the EU.	14
3.3	Energy requirements for textile cleaning.	17
3.4	Key environmental impacts of energy generation.	17
3.5	Environmental impact issues associated with detergent ingredients.	19
3.6	Key indicators of the economic impact of textile cleaning in the EU.	20
3.7	Key detergent builder systems.	24
3.8	Key detergent builder requirements.	24
3.9	Detergent builder performance measures.	25
3.10	Trends in STPP consumption in Western Europe.	26
3.11	Trends in zeolite A consumption in Western Europe.	28
3.12	The environmental and economic impact of textile cleaning in the EU.	32
3.13	Textile cleaning in the EU: Cross impact summary.	32
3.14	The key detergent builder systems: Use phase comparison.	34
3.15	The textile cleaning process in the EU: Improvement summary.	35
4.1	Key environmental impact indicators for agriculture in the EU.	38
4.2	Annual consumption of selected raw materials in the EU.	39
4.3	The relative economic impact of production in the EU.	41
4.4	The economic impact of raw material consumption in the EU.	41
4.5	Emissions from transport associated with detergent builder production.	42
4.6	Approximate cadmium content of commercial phosphate rocks.	43

4.7	Impacts of impurities on phosphoric acid manufacture.	44
4.8	Indication of the environmental impact of STPP production.	46
4.9	Composition of bauxite required by the Bayer process.	47
4.10	Indication of the environmental impact of zeolite A production.	49
4.11	Indication of the environmental impact of zeolite A and polycarboxylate production.	52
4.12	Indication of the environmental impact of an NTA builder system production.	54
4.13	Relative impact of detergent builder production.	55
4.14	The key detergent builder systems: Production phase comparison.	56
4.15	The production of detergent builders in the EU: Improvement summary.	58
5.1	Key wastewater characteristics.	60
5.2	Wastewater treatment: Typical removal rates.	61
5.3	Selected EU markets dependent on the hydrosphere.	63
5.4	Consumer costs for wastewater treatment in the EU.	64
5.5	Plant level costs for wastewater treatment in the EU.	64
5.6	Key cost causative components of wastewater collection and treatment.	64
5.7	EU legislation relevant to the hydrosphere.	66
5.8	Gross pollution and nutrient status of selected inland waters in the EU.	67
5.9	Wastewater collection and treatment in Western Europe.	68
5.10	EU water utility market in 1990 (wastewater).	70
5.11	Wastewater treatment probability in the EU.	71
5.12	Emissions of phosphorus from STPP to the hydrosphere.	73
5.13	Sources of phosphorus to EU surface waters: An indication.	74
5.14	The success of eutrophication control strategies.	75
5.15	Comparative analysis of heavy metals in treatment chemicals.	76
5.16	Emissions of zeolite A to the hydrosphere.	78
5.17	Zeolite A risk to freshwater and marine species.	79
5.18	Emissions of polycarboxylates to the hydrosphere.	82
5.19	Risk of polycarboxylates to freshwater and marine species.	83