



Separation, Collection, Recycling

Workshop, October 30th, 2018

Tbilisi



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General remarks

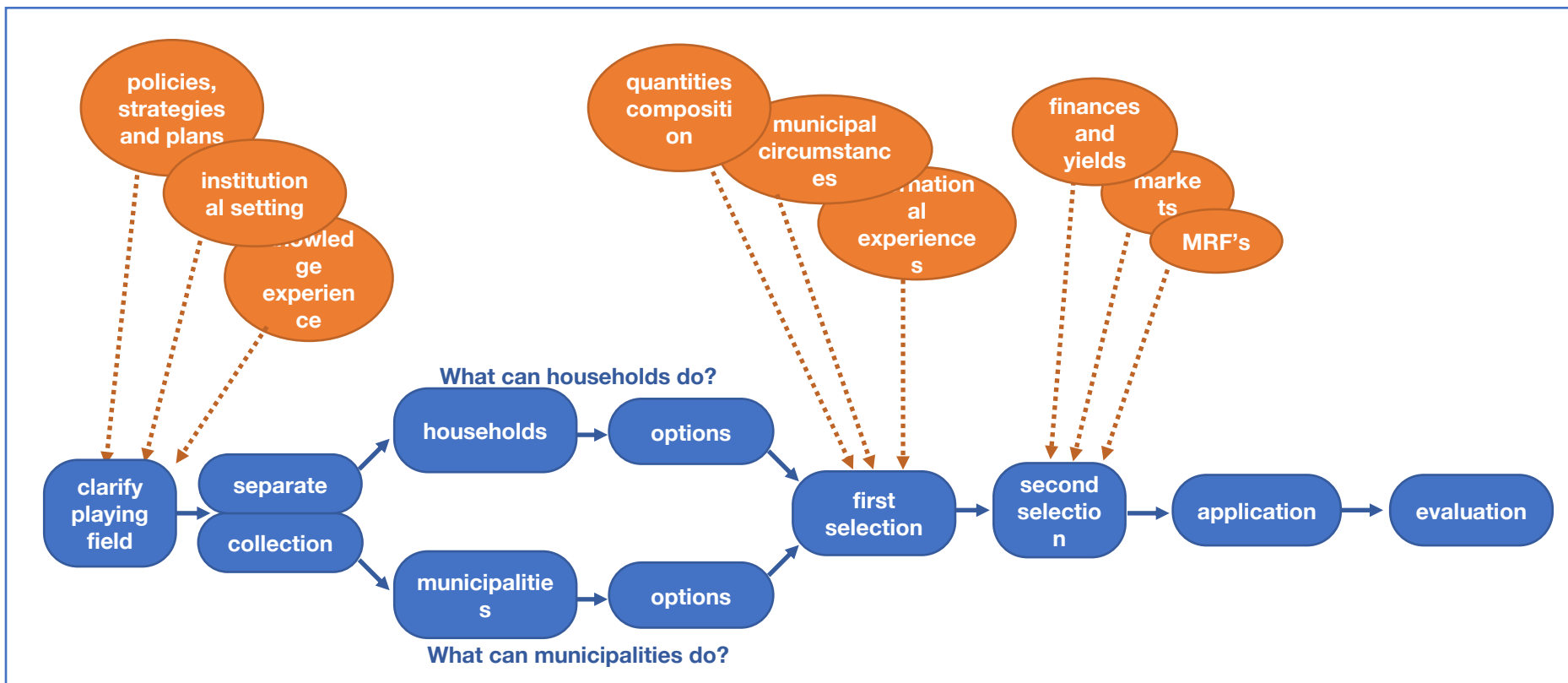
- Aim of project
 - methodical base
 - for introduction of separate collection
 - decision model for investments
 - and for the need of an MRF
 - local -> regional -> national
- Importance of assumptions
- Final report in March



Contents

- Scope
- Georgian legal context
- Institutional setting
- Experiences
 - International
 - Georgia
- Background information
 - Municipal collection
 - Quantities and composition
 - Recycling market
 - MRF financials
- Analysis
- Institutional aspects
- Conclusions, advises, suggestions

Scope: method



Georgian legal context: targets

■ Georgia
● Kutaisi

		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Collection coverage				90%					100%					
Source separation		pilots					50%		100%					
Recycling	Paper			30%			50%		50%					80%
	Glass			20%			50%		50%					80%
	Metal			70%	50%		60%		80%					90%
	Plastic			30%					50%					80%
Recovery of rest									maximum recovery					
Biowaste			strategy						minimum disposal					
EPR pack. waste			strategy	40%					75%					90%
Full cost coverage				systems in place										100%
Refund system for bottles/cans				promoted										
Collection system for magazines/newspapers				system in place										

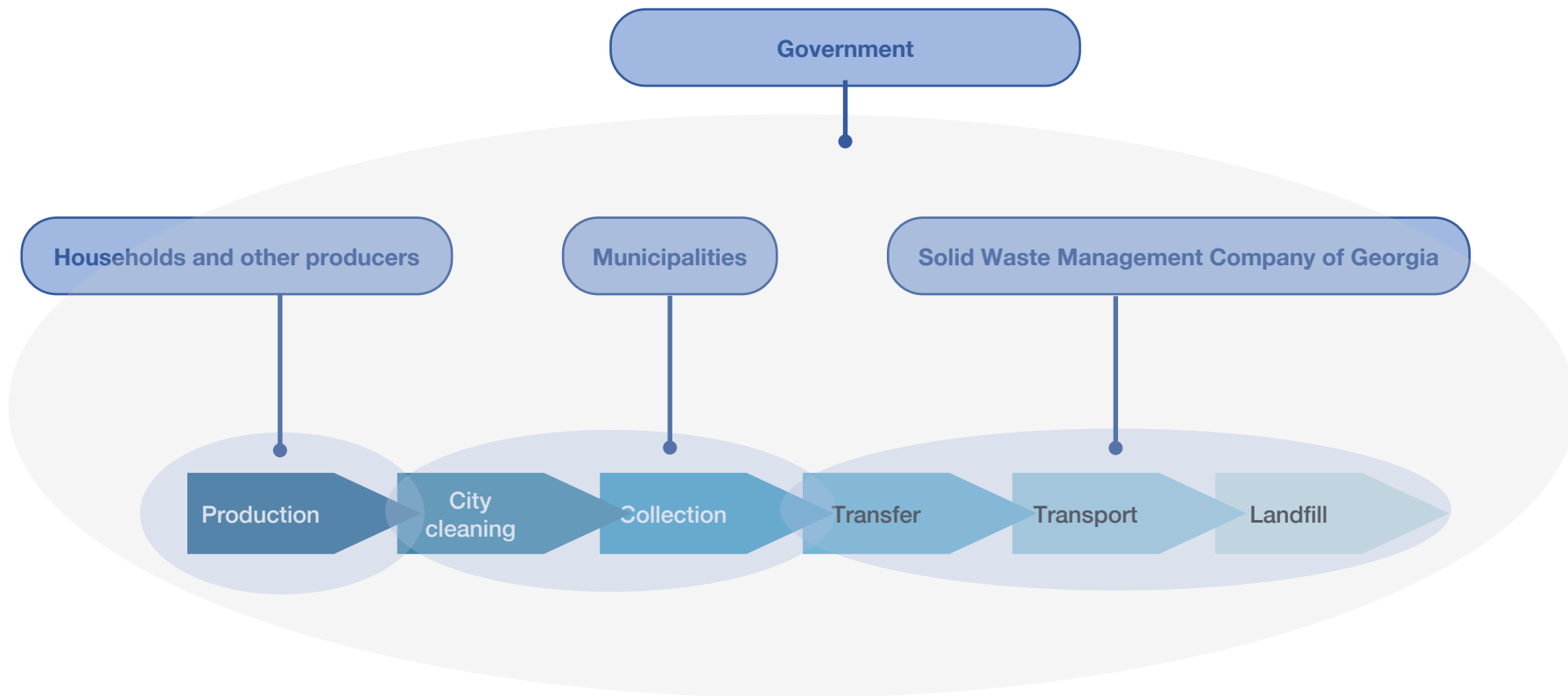


- ambitious
- comprehensive
- urgent

Georgian legal context: uncertainties

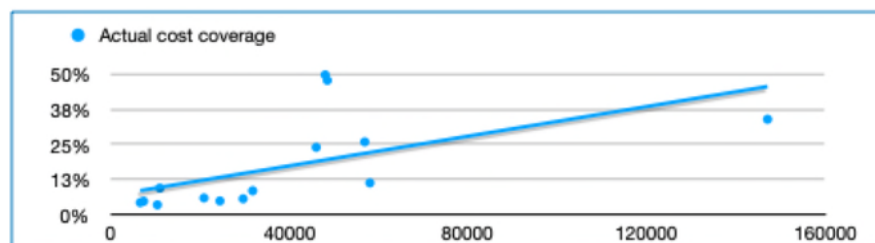
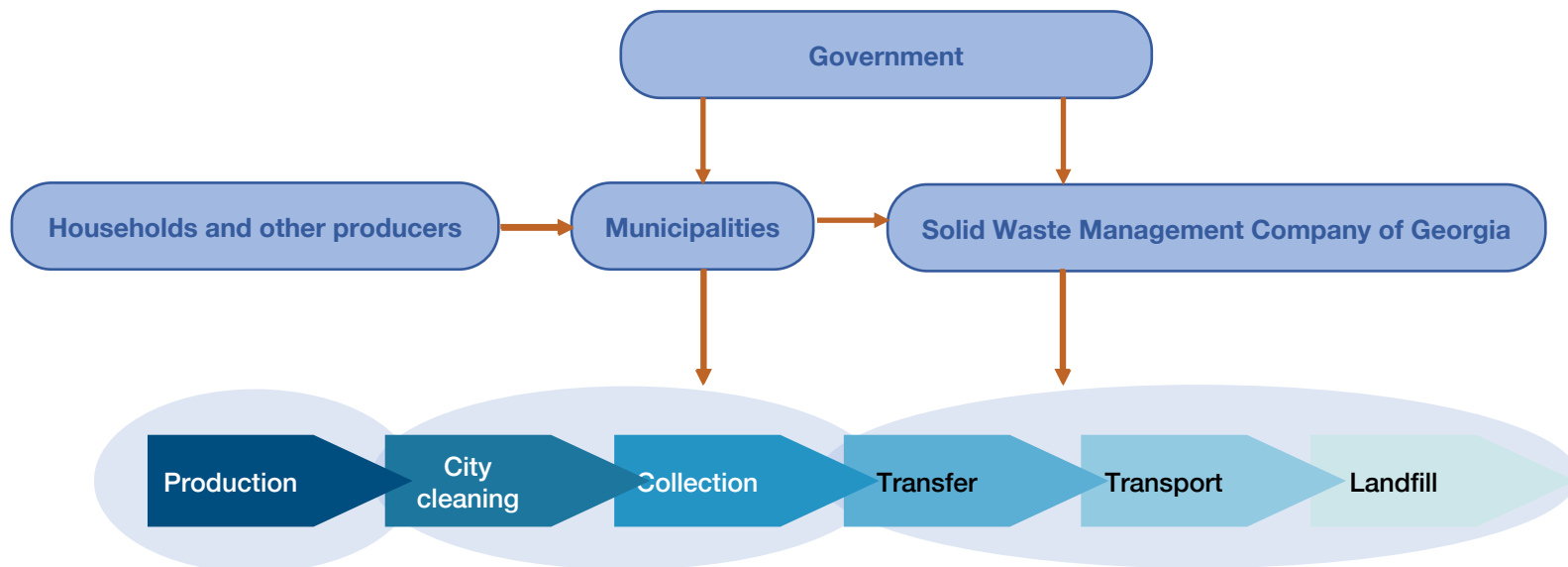
- Percentages recycling: what's their denominator?
 - National, regional or local? What waste?
 - Assumption study: they hold for MSW in every municipality.
- Maximum recovery: how and how much?
 - Incineration and RDF production?
 - Assumption study: not further considered.
- Minimum disposal biowaste: how and how much?
 - No strategy available.
 - Assumption study: difficult to consider right now.
- Alignment EPR with municipal responsibilities: how?
 - Not clear what's going to happen for packaging waste.
 - Assumption study: no dual systems; municipal systems leading
- Refund systems bottles/cans and collection newspapers: how and how much?
 - Not clear. Implementation may take long time.
 - Assumption study: no substantial effects on the short term.

Institutional setting: responsibilities

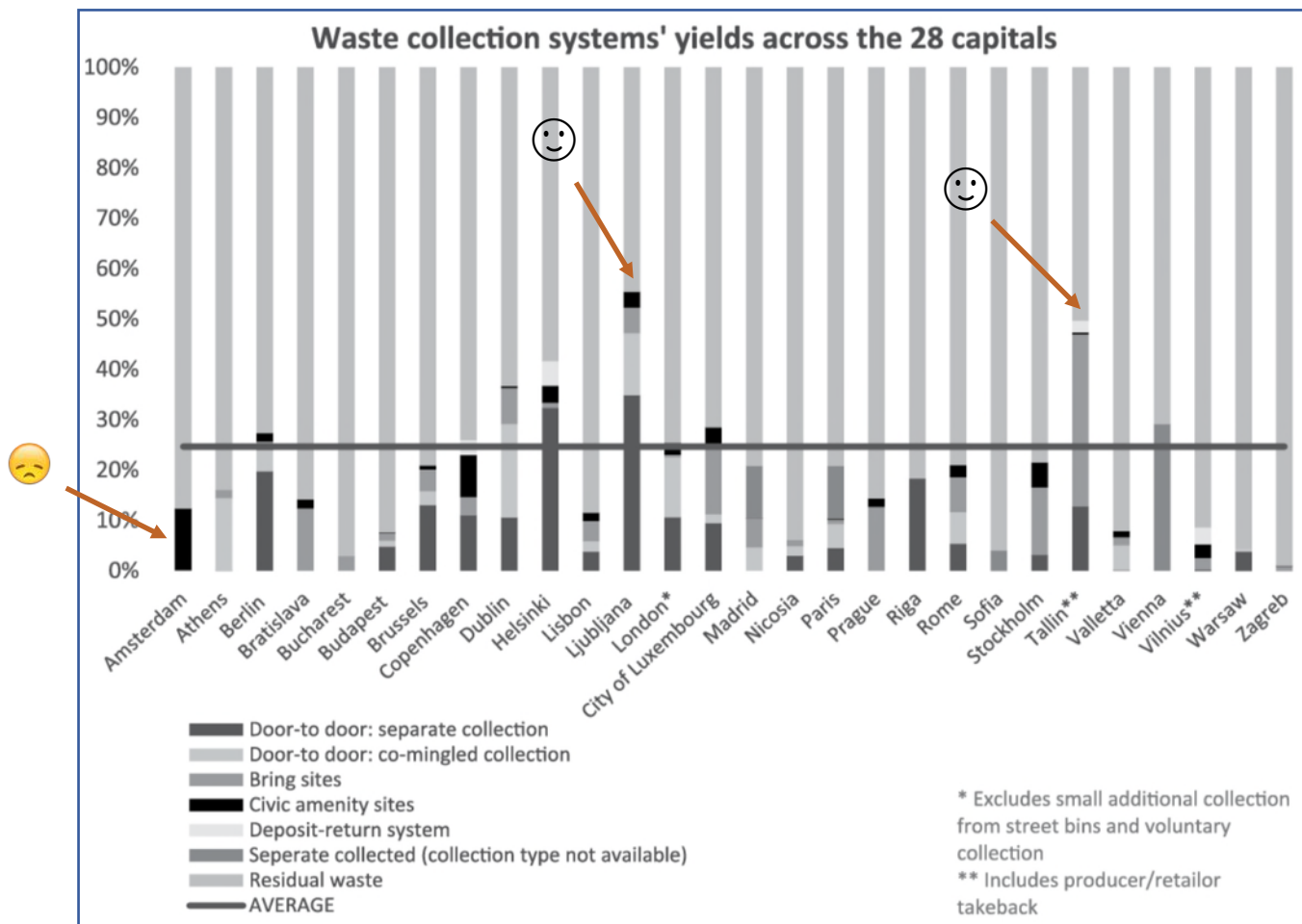


- well separated responsibilities
- sorting/marketing recyclables not yet assigned
- but first responsibility is with municipalities

Institutional setting: money



Experiences: international





Experiences: international

- many cities include separate collection of biowaste
- door-to-door collection gives higher yields and better qualities
- bring systems have problems to achieve higher yields except for glass
- glass is mainly done in bring systems
- co-mingled gives lower costs but also gives risks of cross contamination
- trend is towards more fractions, leading to better qualities

Experiences: Georgia - Kutaisi



- Initiative of NGO Spectri
- Plastic bottles, good quality
- Collection in > 100 street containers
- 70 tons collected by 2017
- Equals < 0,5% of plastic contents
- Sold to local private company
- Estimated overall costs minus revenues:
>€300 per ton?
- Plan for scaling up to 300 containers
- And including other plastics

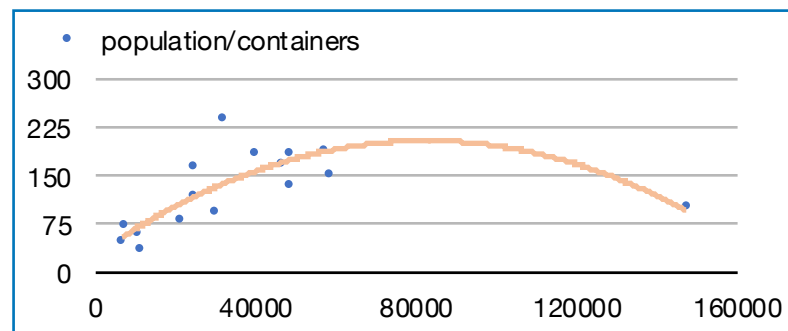
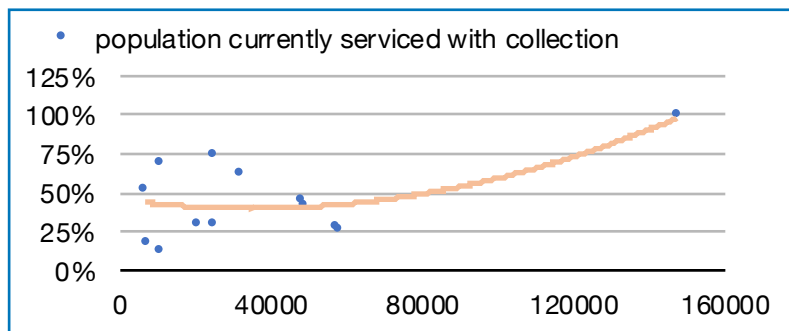
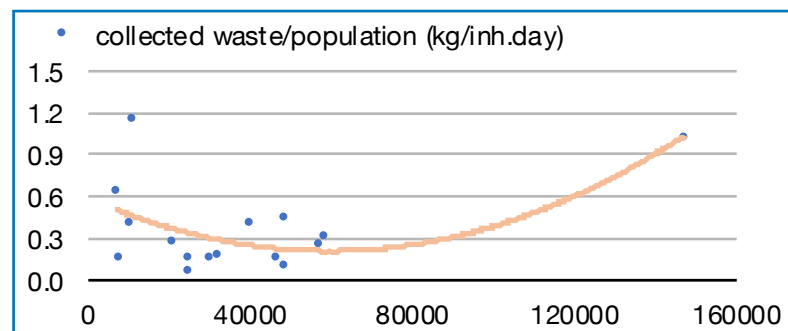
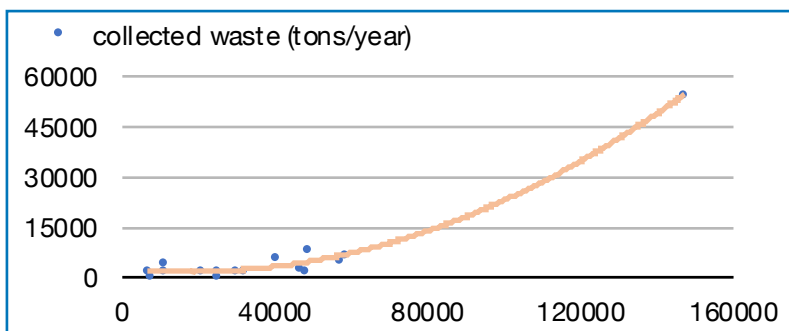
Experiences: Georgia - Rustavi



- Taken over by SWMCG
- Treating 40.000 tons of input/year
- Conveyor belt handsorting of plastics and paper
- 12 employees
- Yields 4-500 tons per year, equals 5%
- Low quality
- Estimated overall costs minus revenues
€ 500 per ton

Background: current waste collection services in project region

population	number of municipalities
100-150.000	1
50-100.000	2
30-50.000	5
10-30.000	6
< 10.000	2



Background: Quantities and composition

Region or project, year	CENN Adjara 2015-2016			CENN Kakheti 2015-2016			CENN Shida Kartli 2017-2018			EUaid Rustavi/urban May 2018			EUaid Rustavi/rural May 2018			Kutaisi municipality			Tsageri Sep 2018		
% of MSW	min	max	av.	min	max	av.	min	max	av.	min	max	av.	min	max	av.	min	max	av.	min	max	av.
Plastics	14,4	19,7	16,7	10,6	15,4	12,8	10,7	18,2	14,3	15,7	21,5	18,5	11,2	21,8	15,5	11	16	13,5	2,9	7,9	5,7
Paper	9,0	19,2	14,7	9,5	14,0	11,2	9,3	15,1	11,7	7,5	8,5	7,8	7,0	16,8	12,1	7	16	10,7	0,7	11,0	3,9
Glass	3,8	5,8	5,0	4,7	9,2	6,0	1,6	5,6	3,3	1,7	4,9	2,7	1,5	2,5	1,8	2	6	4,0	1,8	4,4	2,6
Metals	1,1	2,6	1,7	2,0	3,0	2,3	0,8	2,5	1,8	0,8	1,4	1,1	0,5	3,1	1,8	1	4	1,3	0,5	1,5	1,0
Organics	30,2	41,4	36,6	39,3	45,4	42,7	42,0	54,4	46,7	43,7	50,0	47,7	43,8	52,2	48,5	41	55	43,7	30,0	58,0	44,4

	waste production	plastics		paper		glass		metals		organics	
	ton/year	min	max	min	max	min	max	min	max	min	max
Ambrolauri	1.593	46	126	11	175	29	70	8	24	478	924
Baghdati	3.073	338	492	215	492	61	184	31	123	1.260	1.690
Chiatura	8.151	897	1.304	571	1.304	163	489	82	326	3.342	4.483
Kharagauli	2.773	305	444	194	444	55	166	28	111	1.137	1.525
Khoni	5.091	560	815	356	815	102	305	51	204	2.087	2.800
Kutaisi	49.529	5.448	7.925	3.467	7.925	991	2.972	495	1.981	20.307	27.241
Lentheki	624	18	49	4	69	11	27	3	9	187	362
Oni	872	25	69	6	96	16	38	4	13	262	506
Sachkhere	7.549	830	1.208	528	1.208	151	453	75	302	3.095	4.152
Samtredia	11.803	1.298	1.889	826	1.889	236	708	118	472	4.839	6.492
Terjola	5.064	557	810	354	810	101	304	51	203	2.076	2.785
Tkibuli	4.854	534	777	340	777	97	291	49	194	1.990	2.670
Tsageri	1.479	43	117	10	163	27	65	7	22	444	858
Tskaltubo	13.304	1.463	2.129	931	2.129	266	798	133	532	5.454	7.317
Vani	3.490	384	558	244	558	70	209	35	140	1.431	1.920
Zestaponi	12.224	1.345	1.956	856	1.956	244	733	122	489	5.012	6.723
Total	131.472	14.092	20.666	8.915	20.807	2.620	7.815	1.292	5.145	53.401	72.447

At 30% yield

plastics		paper		glass		metals		organics	
min	max	min	max	min	max	min	max	min	max
4.228	6.200	2.675	6.242	786	2.345	388	1.543	16.020	21.734

Background: Recycling market

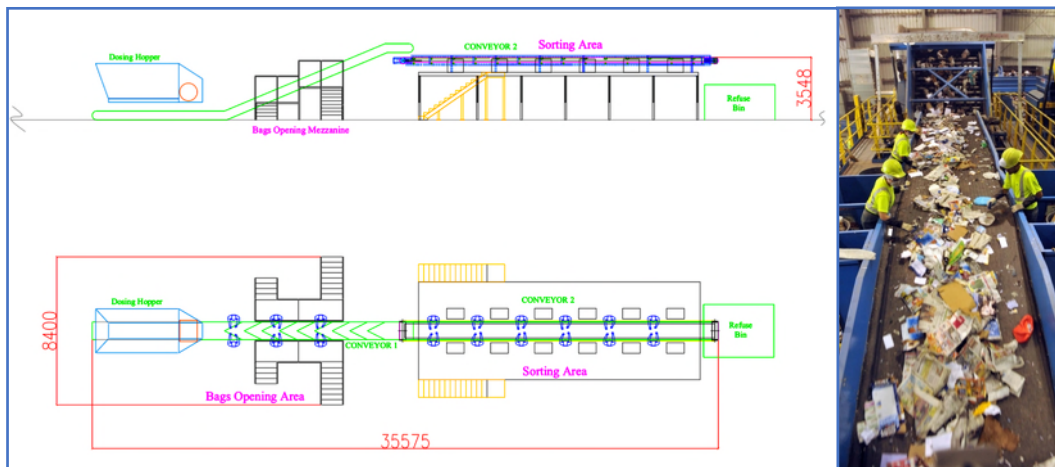
	Location	waste type	GEL/ton delivered	GEL/ton picked up Kutaisi	Tons/year	destination	Remarks
Ltd Georgian Paper Production	Tbilisi	office paper	350	250	5.000	Recycling as hygienic paper	Amenity centers Tbilisi, Kutaisi and Batumi
Ltd Geo Ploimer	Tbilisi	plastic films	260	200	not limited	Recycling/Export	Interviewed
Ltd Georgian pet plast management	Tbilisi	pet, pe bottles and other plastic waste	200	190	not limited	Export Turkey	Interviewed
		plastic films	400	350			
Ltd Kriala	Tbilisi	paper	180-300	180-300	Currently 5.000	Recycling as hygienic paper	Interviewed.Amenity centers Kutaisi and Rustavi
		cardboard	80-200	80-200			
Ltd Paper+	Tbilisi	paper	150-200			Recycling as hygienic paper	
Social enterprise Green Gift	Tbilisi	paper	nihil	nihil	not limited	Recycling as hygienic paper	
Ltd Bokva	Tbilisi	plastic bottles	depends on quality		not limited		
Sole proprietor Izolda Lekvinadze		paper	100	80	not limited	Only collection, sells to Georgian Paper Production	
		cardboard	70	50			
Ltd Sanitari	Rustavi	paper/plastics mix		0	not limited		Interviewed
Jsc Mina	Mtsketa	glass	82		30.000		Interviewed
Ltd Neo Print	Mtsketa	paper	300		10.000	Recycling as cardboard boxes	
		cardboard	250				
Sole proprietor Soso Jijishvili	Mtsketa	mixed plastics	700		120	Recycling as plastic ware	
Cooperative Aluminum 2017	Kutaisi	aluminum cans	500-800	500-800	not limited	Pressed and sold for recycling	
Small enterprise plastic workpiece production	Kutaisi	PE	600		300	Recycling as plastic ware	
Ltd Unagi	Kutaisi	plastic films	300-400	300-400	not limited	Recycling as raw material for plastic pipes	
		plastic bottles	300-500	300-500			
Ltd Sever	Batumi	cardboard	100-120		not limited	Export	
		plastic bottles	200-250				
Ltd Roni	Batumi	paper	160		100	Recycling as hygienic paper	
Ltd Zugo	Batumi	plastic films	500-900		400	Recycling as plastic film	



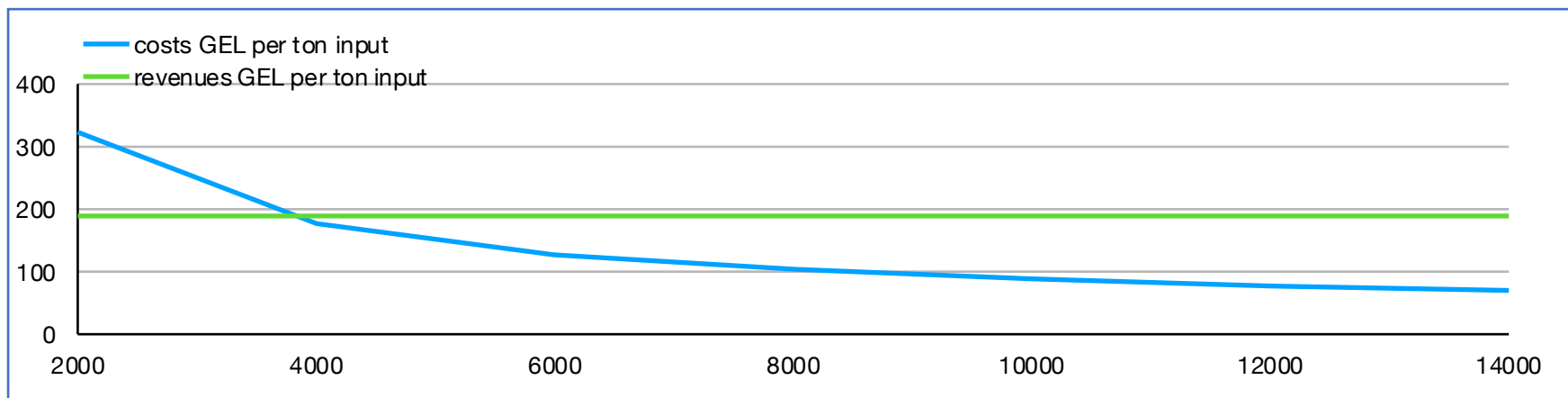
GEL/ton	Min	Max	Average
Mixed plastics	0	700	50
Plastic bottles/films separate	200	900	200
Paper/Cardboard mixed	70	150	100
Paper/Cardboard separate	70	350	200
Glass	--	--	82
Metals	350	400	350

- Sufficient absorption capacity
- Good market orientation
- Already preparing on international markets
- Prices highly dependent on volumes
- Prices seem to be on the low side

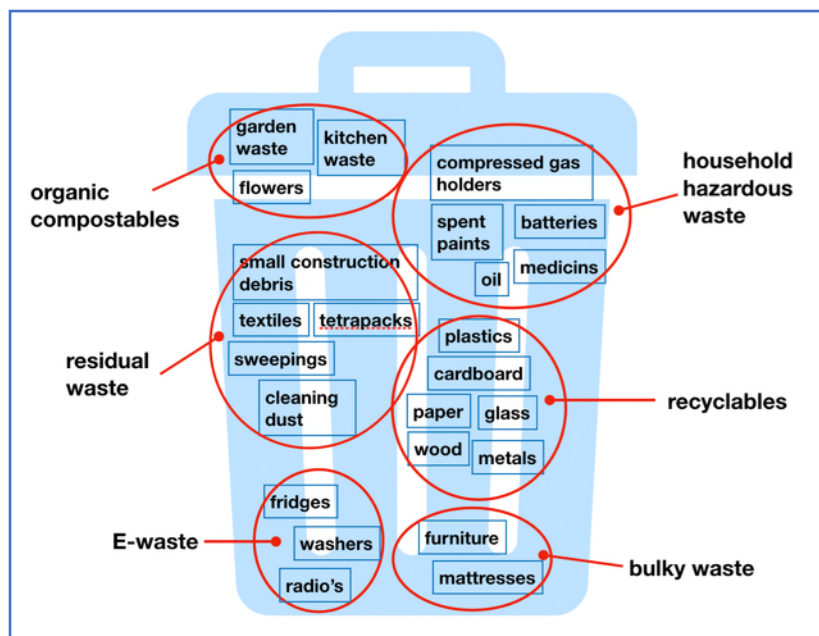
Background: Basics of an MRF, a Materials Recovery Facility



- typical capacity: 10.000 tons/year
- plastics and paper mix
- sorting in 7 fractions:
 - plastic bottles, rigid plastics, films
 - paper, cardboard
 - metals, residues
- only handpicking
- products to private companies
- investments including civil works: € 1 mln
- at landfill site: - 25% investments
- break-even at 4.000 tons per year.
- costs and revenues are then: 200 GEL/ton
- important: start up effects



Analysis: Separation - what can households do?



When separating:

- plastics and paper can be combined
- glass must be kept apart from paper and plastics
- metals (cans) can be combined with glass, paper and/or plastics
- household hazardous waste and bulky waste to civic amenity centers
- if organic waste is not separated, it stays as part of residual waste

Analysis: Separation - what can households do?

- fractions under consideration are:
 - paper/cardboard
 - plastics
 - glass
 - metals
 - organic waste
 - residual waste
- general opinion from interviews: 3 or maximum 4 fractions to start with.



Analysis: Separation - What are realistic options?

# separate fractions	option 1	option 2	option 3	option 4	remarks
1	✗ mixed waste				no match with national strategy and action plan
2	✗ mixed recyclables residual waste	✗ organic fraction residual waste	✗ one recyclable residual waste		only option 1 would match with policy but this would mean that glass must be collected in the mix which is not feasible
3	✗ mixed recyclables organic fraction residual waste	✓ paper/plastics/metals glass residual waste	✗ organic fraction glass residual waste	✗ glass plastics residual waste	only options 1 and 2 match with policy but option 1 would mean that glass must be collected in the mix which is not feasible
4	✓ glass plastics paper residual waste	✓ paper/plastics glass organic fraction residual waste			4 fractions provides the opportunity to introduce separate collection of organic waste

• Separating 3 fractions:

- (i) mix of paper/plastics, (ii) glass and (iii) residual waste

• Separating 4 fractions:

- (i) glass, (ii) plastics, (iii) paper and (iv) residual waste
- (i) paper/plastics, (ii) glass, (iii) organic fraction and (iv) residual waste

Analysis: Collection - what can municipalities do?



Kerbside collection



Bell/block collection



Street container collection



Civic amenity center

Analysis: Collection - Examples of kerbside separate collection



Analysis: Collection - Examples of streetcontainer separate collection



Analysis: Collection - Comparison of systems

comparison of non financial aspects	kerbside collection	(street) container collection
needed households effort	little	some, depending on distance
needed household space	yes	little
all and every day access for households?	no, day and time slot set	yes
occupation of urban space	no	yes
risk of littering, fire, waste picking	some	some
feasible as main collection system	yes	yes
experience in Georgia	no	yes dominant system

Analysis: Collection - Elaboration for separate collection

separate fractions	kerbside collection	street container collection
paper	bags or boxes not weekly regular/compaction trucks	specific container importance walking distance daily emptying
glass	crates/bins regular trucks not weekly	specific container importance walking distance emptying when full
plastics	weekly bags or bins compaction trucks	specific container importance walking distance daily emptying
paper/plastics	weekly bags or bins regular/compaction trucks	specific container importance walking distance daily emptying
residual waste	daily to weekly bins or bags compaction trucks	daily emptying present distance present container
organic fraction	daily to weekly bins compaction trucks	daily emptying present distance present container

Analysis: Collection - Factors influencing quantity and quality

Factor	Quantities	Qualities	Remarks
collection frequency	↗	↗	Strong relation in case of kerbside. Depending on volume and nuisance.
# fractions	↗	↗	Strong relation. Step by step program increase.
mandatory/voluntary	↗	↗	Strong relation. Need for control and enforcement.
distance to point	↘	?	Strong relation. Closer than 200 m (regulation 159).
communication	↗	↗	Strong relation. Don't under-estimate.
visual control	?	↗	Informal social control and pressure.
ease for residual waste	↘	?	Don't make it easier Consider future "pay as you throw".
detail specifications	↘	↗	Related to # fractions

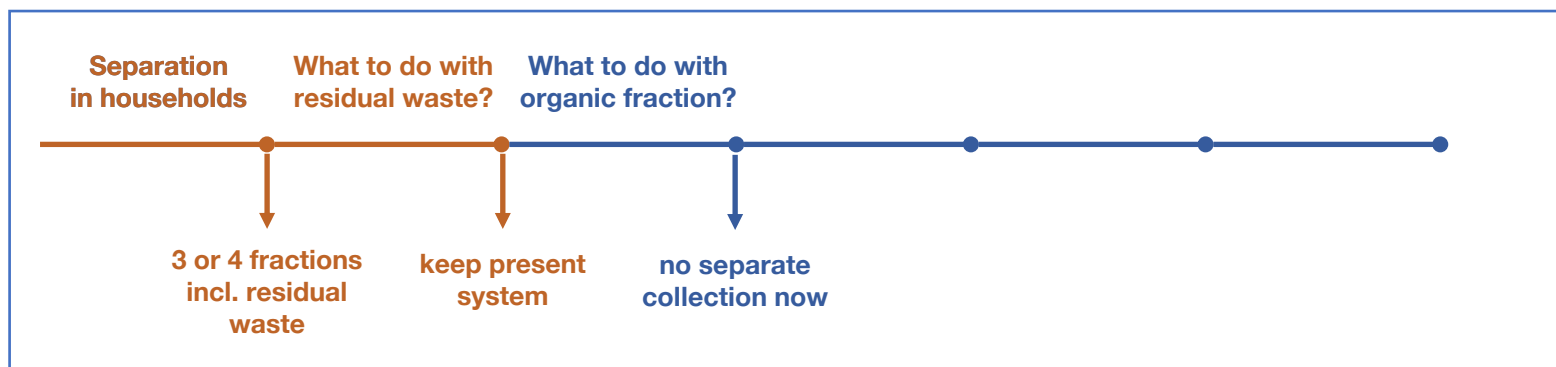
Analysis: Collection - What to do with residual waste?

- service levels are good
- households and municipal departments are used to the system
- changing to kerbside collection would be major change
- let's concentrate on introduction of separate collection of recyclables
- so, stick to the present system



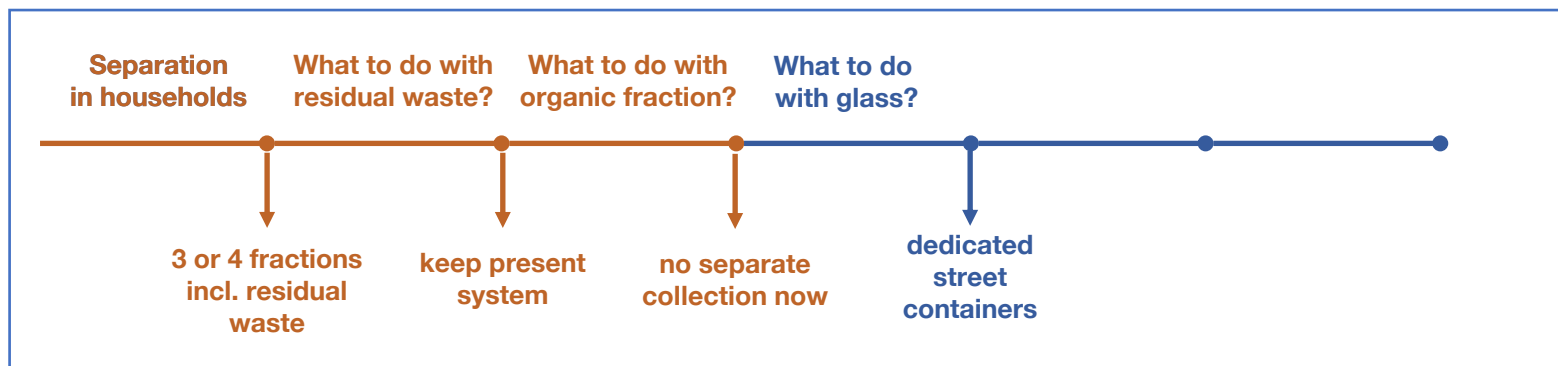
Analysis: Collection - What to do with organic fraction?

- percentages around 50%
- large potential for recycling and reduction of greenhouse gas emissions.
- but introduction at this moment may lead to overload
- and the national plan does not implicitly ask for separate collection
- and all the same: there is no strategy yet
- so, no considering of separate organics collection now
- and wait for the strategy



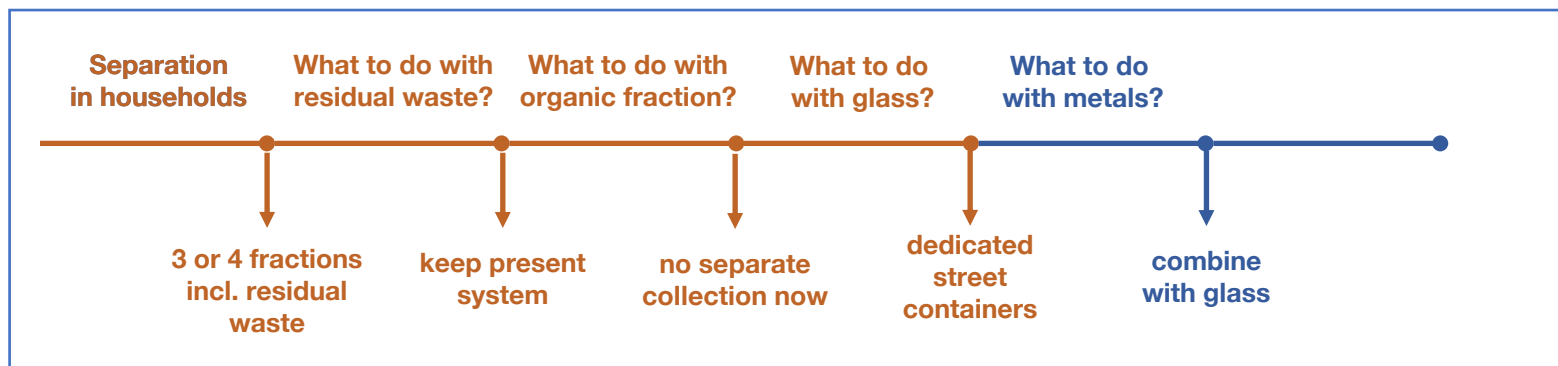
Analysis: Collection - What to do with glass?

- general opinion may be a little reluctant towards glass collection
- but average content is still 4%, equalling > 50.000 tons per year
- good interest in this waste glass at Mina glass factory
- in general it appears to be the cheapest recyclable to collect
- and there is a legally set target of 20% in 2020
- there is no need to wait for EPR and deposit/return systems
- international experience: preference for street container collection
- introduction can start at low density and then grow
- so, let's go for collection by dedicated street containers



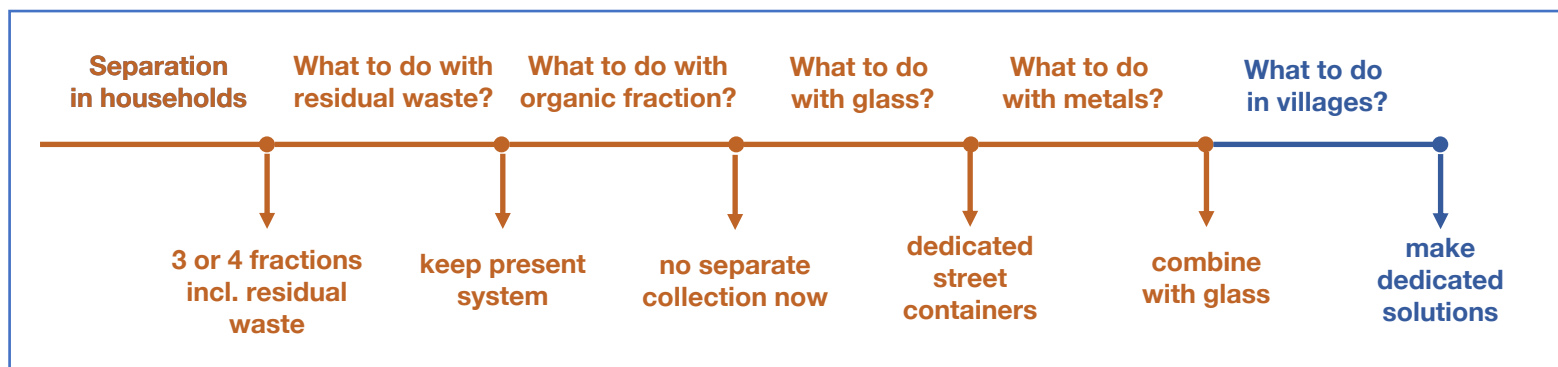
Analysis: Collection - What to do with metals?

- also considered to be minor fraction
- still some 20.000 tons per year
- and also easy to collect and recycle
- can be combined with plastics, paper and glass
- combining with glass will reduce risk of scavenging in containers
- so, let's assume to combine it with glass in this study



Analysis: Collection - What to do in villages and rural areas?

- no general approach possible because of vast variety in circumstances
- the collection yields will be low and costs will be high
- offering the population at least some option can be considered
- but then look for case-by-case and dedicated solutions



Analysis: Separate collection - What options and questions are left?

# separate fractions	option 1	option 2
3		✓ paper/plastics glass/metals residual waste
4	✓ glass/metals plastics paper residual waste	✗ paper/plastics glass/metals organic fraction residual waste

Remaining questions:

- paper and plastics separate or combined in one fraction?
- paper, plastics or their mix, collected kerbside or via street containers?
- what does it yield and cost?

Analysis: Model calculations - considered combinations.

Street container collection
for paper, plastics or mix



Kerbside collection
for paper, plastics or mix



Street container collection for
glass/metals mix





Analysis: Model calculations - excel spreadsheets

	Total		Urban		Roads
	population 2020	area (km ²)	population 2020	area (km ²)	urban (km)
Kutaisi	163000	65	163000	55	231
Samtredia	51000	360	28000	40	127
Tsageri	10000	775	1500	2 (est.)	10 (est.)

	Public response Kutaisi/Samtredia (kg/inh.day)		Public response Tsageri (kg/inh.day)		Yield project region (ton/year)	
	street container	kerbside	street container	kerbside	street container	kerbside
Plastics	0,015	0,030	0,001	0,003	1.655	3.312
Paper	0,015	0,030	0,003	0,005	1.659	3.316
Glass	0,005	n.a.	0,001	n.a.	553	n.a.
Metals	0,003	n.a.	0,001	n.a.	333	n.a.
total	0,038	0,060	0,006	0,008	4.200	6.829

Street container collection paper, plastics and paper/plastic mix	Container type	Kutaisi cage container type 1,1 m ³		
	Means of collection	In bags provide by the municipality		
	Walking distance	Around 400 meter		
	Frequency emptying	Minimum frequency of 1 time per 2 weeks		
Kerbside collection paper, plastics and paper/plastic mix	Delivery	Delivered at nearest transfer station		
	Means of collection	In bags provide by the municipality		
	Collection points	Every 50 meter		
	Frequency	Minimum frequency of 1 time per 2 weeks		
Street container collection of glass/ metals mix	Delivery	Delivered at nearest transfer station		
	Container type	Dedicated street container 2 m ³		
	Walking distance	Around 1000 meter		
	Frequency	Emptying when full		
	Delivery	Delivered at nearest transfer station		

dedicated street containers for plastics/paper	Volume 3 m ³	Investment €500 per container	Depreciation in 5 years	Maintenance 10% per year Insurance 2% per year
Kutaisi type street containers	Volume 1,1 m ³	Investment € 250 per container	Depreciation in 5 years	
street container for glass/metals	Volume 2 m ³	Investment € 300 per container	Depreciation in 5 years	
collection truck for emptying street containers	Volume 16 m ³	No compression	Investment € 70.000 Depreciation in 10 years	2 employees per truck
collection truck for kerbside collection of paper/plastics	Volume 16 m ³	No compression	Investment € 60.000 Depreciation in 10 years	4 employees per truck
truck speed container collection	30 km/hr towards routes 10 km/hr in routes	Distance to routes 10 km	Time needed per container 2 minutes	Time needed for emptying 15 minutes
truck speed kerbside collection	30 km/hr towards routes 5 km/hr in routes	Distance to routes 10 km	Time needed per collection point 1 minutes	Time needed for emptying 15 minutes
collection days and hours	7 days per week	10 hours per day		
wages and working hours	driver €20 per day	leader €2150 per day	8 hours per day	
rates	interest 8% per year	maintenance 5% per year	insurance 2% per year	
truck data	uptime 175.000 minutes per year	fuel consumption in routes 5 ltr/hr	costs €9,02 per bag	fuel costs €1,30/ltr
household collection bags	1 bag per household per week			
Bulk densities in kg/m ³	plastics	paper	glass	plastics, paper, cans
kerbside truck uncompressed	30	300	450	100
kerbside truck compressed	120	430	270	300
street container	40	300	300	100

Street container collection paper/plastics Kutaisi					Kerbside collection paper/plastics Kutaisi				
parameter	unity	500 large containers	500 current container		parameter	unity	district 1		
collection days per week	#	7	7		needed trucks	#		1,4	
needed trucks	#	0,7	0,9		employees/truck	#		4	
routes per year	#/year	1.112	1.112		wage of driver	€/day		20	
employees/truck	#	2	2		wage of loader	€/day		15	
wage of driver	€/day	15	15		working time	min/day		480	
wage of loader	€/day	12	12		labour cost per truck	€/min.truck		0,135	
working time	min/day	480	480		investment truck	€/day		60.000	
labour cost per truck	€/min.truck	0,056	0,056		depreciation time truck	€/year		10	
investment truck	€/day	70.000	70.000		interest	€/year		8	
depreciation time truck	€/year	10	10		maintenance	€/year		5	
interest	€/year	8	8		insurance	€/year		2	
maintenance	€/year	10	10		capex per truck	€/year		15.000	
insurance	€/year	2	2		truck uptime per year	min/year		175.000	
capex per truck	€/year	21.000	21.000		capex per time	€/min		0,09	
truck uptime per year	min/year	175.000	175.000		fuel consumption ex route	km/ltr		3	
capex per time	€/min	0,12	0,12		fuel consumption in route	min/ltr		5	
fuel consumption ex route	km/ltr	3	3		fuel consumption emptying	min/ltr		5	
fuel consumption in route	min/ltr	5	5		fuel consumption per route	ltr/route		27	
fuel consumption emptying	min/ltr	5	5		fuel cost	€/ltr		1,3	
fuel consumption per route	ltr/route	20	25		fuel cost per route	€/route		35	
fuel cost	€/ltr	1,3	1,3		labour cost per route	€/route		19	
fuel cost per route	€/route	26	33		capex per route	€/route		12	
labour cost per route	€/route	6	8		total cost per route	€/route		66	
capex per route	€/route	13	16		cost of routes per year	€/year		145.777	
total cost per route	€/route	45	57						
cost of routes per year	€/year	49.511	62.872		price collection bags	€/bag		0,02	
investment per container	€/container	500	250		number of households	#		47.941	
depreciation time container	€/year	20	20		distributed bags per household	#/week		1	
interest	€/year	8	8		bag distribution	#/year		2.492.941	
maintenance	€/year	10	10		cost of bags	€/year		49.859	
insurance	€/year	2	2						
capex per container	€/year.cont.	200	100		total costs per year	€/year		195.639	
capex/year	€/year	100.000	50.000		total costs per household	€/househ.yr		4,1	
price collection bags	€/bag	0,02	0,02		total costs per person	€/person.yr		1,2	
number of households	#	47.941	47.941		total costs per ton	€/ton		65	
distributed bags per household	#/week	1	1		tons collected	ton/year		3.670	
bag distribution	#/year	2.492.941	2.492.941						
cost of bags	€/year	49.859	49.859						
total costs per year	€/year	199.370	162.731						
total costs per household	€/househ.yr	4,2	3,4						
total costs per person	€/person.yr	1,2	1,0						
total costs per ton	€/ton	112	91						
tons collected	ton/year	1.785	1.785						

Analysis: Model calculations - results for collection costs

street container and kerbside costs alike

mix paper/plastics cheaper than separate

glass/metal collection is cheapest

cost in euro's		Kutaisi			Samtredia			Tsageri		
		Total	Per household	Per ton	Total	Per household	Per ton	Total	Per household	Per ton
Plastics	street container	211.048	4,4	236	70.620	8,6	461	3.500	7,9	6.393
	kerbside	231.175	4,8	130	74.665	9,1	244	4.544	10,3	2.766
Paper	street container	130.663	2,7	146	54.659	6,6	357	2.986	6,8	1.818
	kerbside	104.978	2,2	59	35.510	4,3	116	2.474	5,6	904
Mixed paper/plastics	street container	162.731	3,4	91	57.889	7,0	189	3.006	6,8	1.373
	kerbside	195.636	4,1	55	68.560	8,3	112	4.527	10,3	1.034
Glass/metals	street container	21.706,0	0,5	46	6.446	0,3	79	390	0,9	356

# trucks pl/pa-mix	street container	kerbside
Kutaisi	0,9	1,4
Samtredia	0,3	0,6
Tsageri	0,01	0,04

Kutaisi: €4 per hh per yr
Samtredia/Tsageri: € 8

per ton costs are lower for kerbside

lower scale and density lead to higher costs

Analysis: Model calculations - results for overall costs in Kutaisi

costs in euro's		Kutaisi					
		costs for separate collection	costs of MRF	revenues	intrinsic profit or loss (-)	prevented landfill costs	overall profit or loss (-)
Plastics and paper separate	street container	340.000	0	120.000	-220.000	30.000	-190.000
	kerbside	335.000	0	240.000	-95.000	60.000	-35.000
Plastics and paper mixed	street container	160.000	70.000	120.000	-110.000	30.000	-80.000
	kerbside	195.000	140.000	240.000	-95.000	60.000	-35.000
Glass/metals	street container	21.000	0	15.000	-6.000	8.000	2.000

overall separate collection is not profitable

gatefee at landfills can be extra incentive

strong effect of yield

when plastic/paper collected separately: kerbside cheaper

when plastic/paper collected as mix: difference is lower

glass collection goes towards break-even

Analysis: Model calculations - results for overall costs in project region

Extrapolation

- with results of Kutaisi, Samtredia and Tsageri
- to the two project regions Imereti and Racha-Lechkhumi/Kvemo Svaneti
- separate collection only in urban areas with 90.000 households
- collection of paper and plastics in mix through kerbside collection

extrapolated costs and revenues for the 16 municipalities together	yearly costs (-) and revenues (+) in euro per year
Collection	-620.000
MRF sorting	-280.000
Revenues	530.000
Prevented landfill	120.000
Overall	-250.000

Which would give

- overall costs of €0,25 or 0,70 GEL per serviced household per month
- or half of that when calculated for all the households in the region

Analysis: Model calculations - results for overall costs in project region

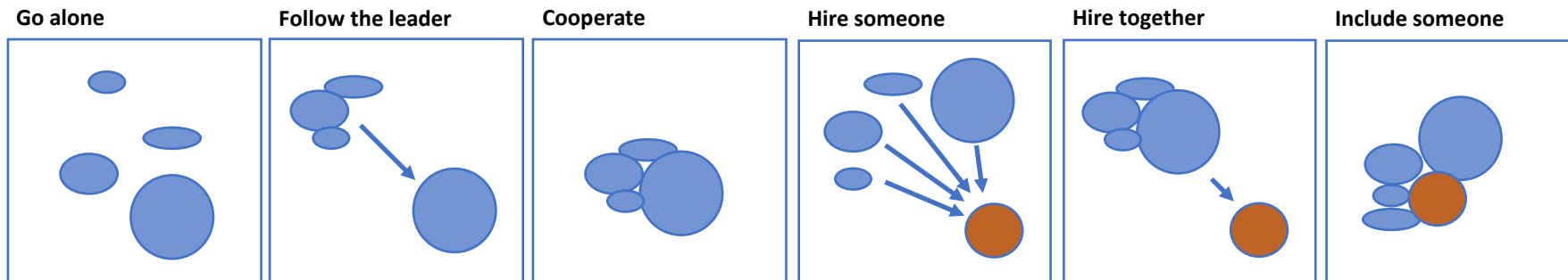
Not included in these costs are:

- transport costs from municipalities to MRF
- adaptation of road infrastructure to accommodate more street containers
- extra costs of staff and strengthened law enforcement
- costs of awareness campaigns



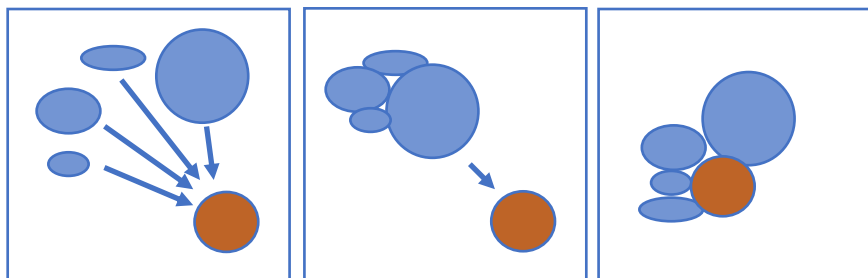
Activity	Costs
TV and Radio spots	€ 35.000
PR work in regional and national TV	€ 0
Infographics for communication via facebook, websites and small booklets	€ 15.000
Regular communication activities in municipalities	€ 115.000
Total (for three years)	€ 165.000

Institutional aspects - Cooperation between municipalities



- Sharing of collection trucks and containers
- Jointly operating cross-border collection routes in more remote areas
- Jointly procuring new equipment or outsourcing collection services
- Combine volumes in order to set up and operate an MRF
- Jointly contracting the sale of recyclables to private recyclers
- Setting up uniform awareness and law-enforcement programs
- Sharing knowledge and experiences
- Sharing costs and revenues of shared facilities
- Join forces in negotiations with
 - SWMCG (on gatefees and service levels) and
 - PRO's (on the municipalities' role in EPR schemes).

Institutional aspects - Role of SWMCG



- The Company could play an important role in implementing an MRF
- Could lighten the tasks already on the shoulders of municipalities
- Has the scale and the facility
- Could reduce investments
- Could spread the experience through Georgia
- Would need firm contracts between SWMCG and municipalities



Institutional aspects - Role of private sector

- Role will grow when value chain will be disrupted and fragmented
 - more fractions
 - more separate collection
 - more recycling
 - growing markets
 - growing role PRO's
- Prepare for new contracts and higher volumes coming from municipalities
- Take over separately collected and pre-sorted recyclables
- Professionalise capacities and services
- Prepare for changing roles in the future



Institutional aspects - Influence of introduction of EPR

- Dual responsibilities
- Especially with regard to packaging waste
- But for sure: no dual systems
- Direction must be: municipalities and PRO's must work together
- Most probable outcome
 - Municipalities will design and operate collection systems
 - PRO's will be partner in setting and achieving targets
 - Municipalities will be paid for their part in packaging waste
 - Such must be arranged in contracts
- And for this: municipalities must work together

Conclusions, advises and suggestions

- Municipalities are preparing for separate collection
- Knowledge and experience need to be strengthened
- Pilots and sharing experiences are very important
- Street container separate collection is good, but look further
- Good to start with 3 to 4 fractions
- Consider combining plastics and paper
- All-in costs range around less than 1 GEL per serviced household per month
- In that case an MRF is needed
- Municipalities must work together to reduce costs and gain speed
- They could consider to invite the Company to do the MRF
- That would need firm contracts
- Recycling industry is growing and focusing on professionalism and international trade
- Roles and positions will change in the upcoming years
- Accept uncertainty and this development