Integrated Solid Waste Management Kutaisi
– Accompanying Technical Training –

Acquiring and Using Waste Data for Monitoring and Optimization of Local Waste Management
-Conduct, findings and conclusions of the pilot studies in the project area-

Training for
Municipalities & Services responsible for managing municipal waste (MSW) in the Imereti and Racha-Lechkhumi-Kmevo Svaneti region of Georgia
with a particular focus on the mountainous municipalities

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Expert team Solid Waste Management

Preparation and conduct of pilot studies (I)

Starting situation

- **WMP process:**   **- Limited availability and consistency of data**
  - **- Statistic indices** (ton per person, GEL per ton, GEL per served citizen)
  - **- Commitment of local administration and services**
- **Service capabilities (service coverage, equipment situation)**
- **Specific territorial conditions/challenges and particular role in the future ISWM**
- **Allocation and supply of new SWM equipment**

Concept

- **Selection of area for pilot studies: Municipality of Tsageri / (Lentekhi)**
  aside from the above indicators
  - Place of a landfill and future transfer station
  - Deliveries of collected waste from two municipalities (coverage by analysis)
  - Significant extension of services but also remaining potentials after equip. sup.
  - Tourism and recycling visions
  - Manageable size

- **Conduct of <u>tour escort</u> and <u>waste characterization studies</u>** (at least 3 campaigns)

Place of the initial pilot

Preparation and conduct of pilot studies (II)

Implementation (tour escorts)

- **Early notification/joint agreement with munic. administration, supply of details**
- **Meetings before and past each campaign with administration and special services to agree on schedules, needed support, discuss observations**
- **Integration of SWMCG to ensure processes and cooperation at the landfill**
- **Two 1-week study campaigns, so far September 2018, May 2019**
- **Tour escorts in Tsageri,**
  - all urban structures (4)
  - all tour arrangements (5) covered
  - combined with
   GPS records
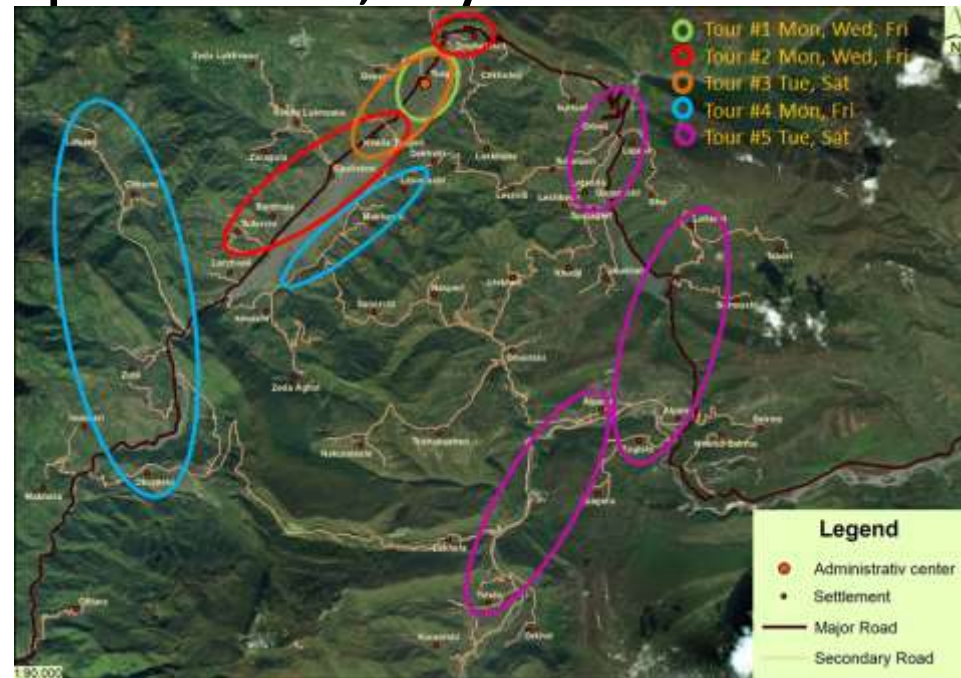
Preparation and conduct of pilot studies (III)

Implementation (waste characterization)

- **Waste sorting analysis**

  - of the waste collected in each urban structure of Tsageri municipality

  - of waste deliveries from Lentekhi to the landfill

- **In total 13 samples** (1st campaign: 7, 2nd campaign: 6)

- **Each waste sample in the range of 102-150 kg**

- **In total about 8.5 m³ of waste analyzed** (1st campaign: 4.22, 2nd campaign: 4.21)

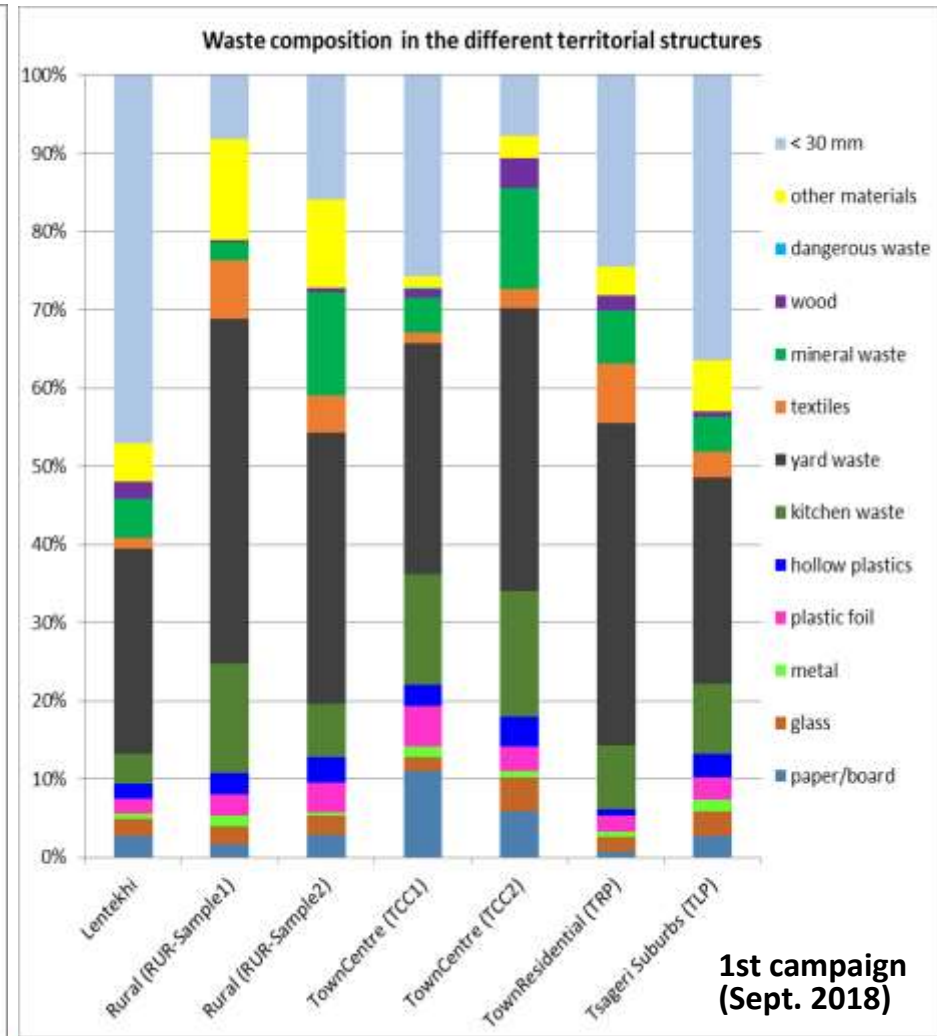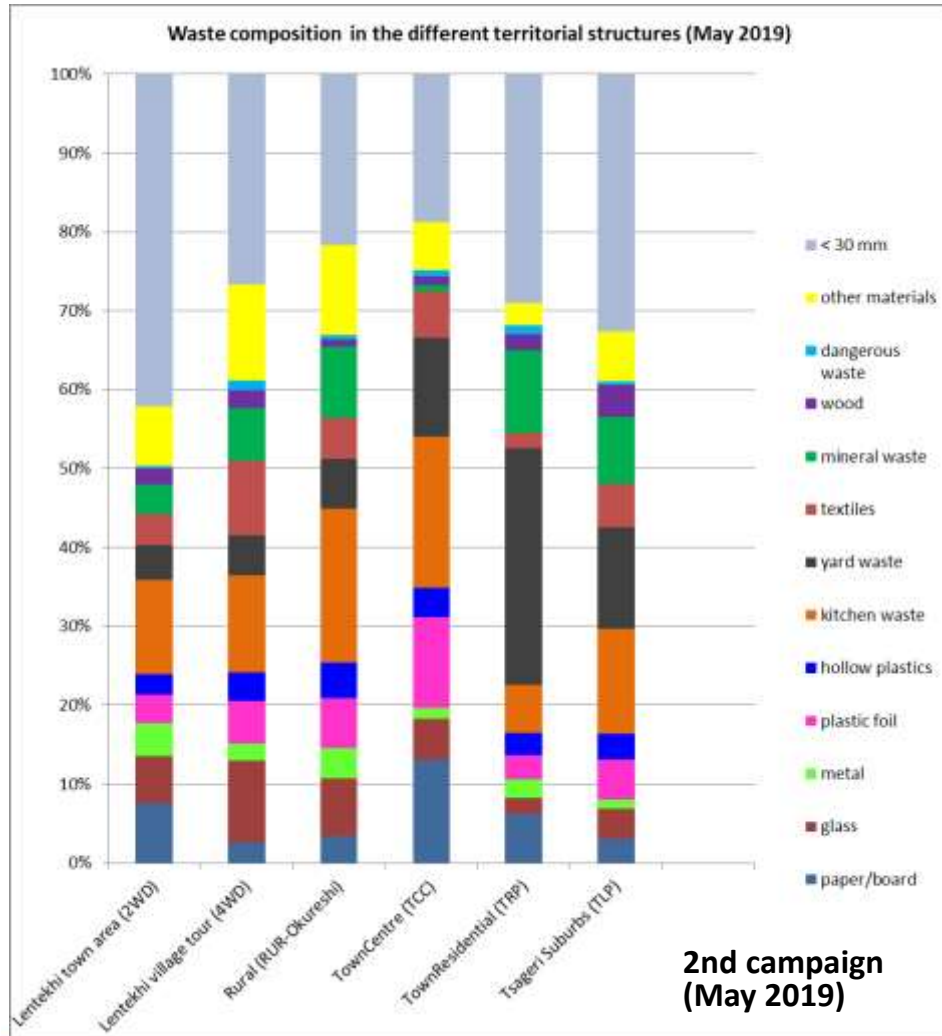# Results: Waste composition (I)

Overall findings

- **Main material fractions: Yard waste and fines <30 mm (ø∑ 49.8%), kitchen waste and inert waste follow, paper and textiles also significant**

- **60 % and more of the waste components suit for composting !**

- **Insignificant amounts of dangerous waste components**

- **Share of recyclables** (paper/cardboard, glass, metal, plastic foil & hollow plastics) **varies between the different urban structures and seasons 1st campaign: 6 % – 22 %, 2nd campaign: 16 % – 35%**

- **Significant amounts of recyclables in the commercial centre**

- **Largest portion is paper, comprising mostly cardboard/packaging paper**

- **Quality of paper in the waste mix does often not meet recycler's requirements !**

- **Plastic foils are significantly above the share of hollow plastics** (e.g. bottles)

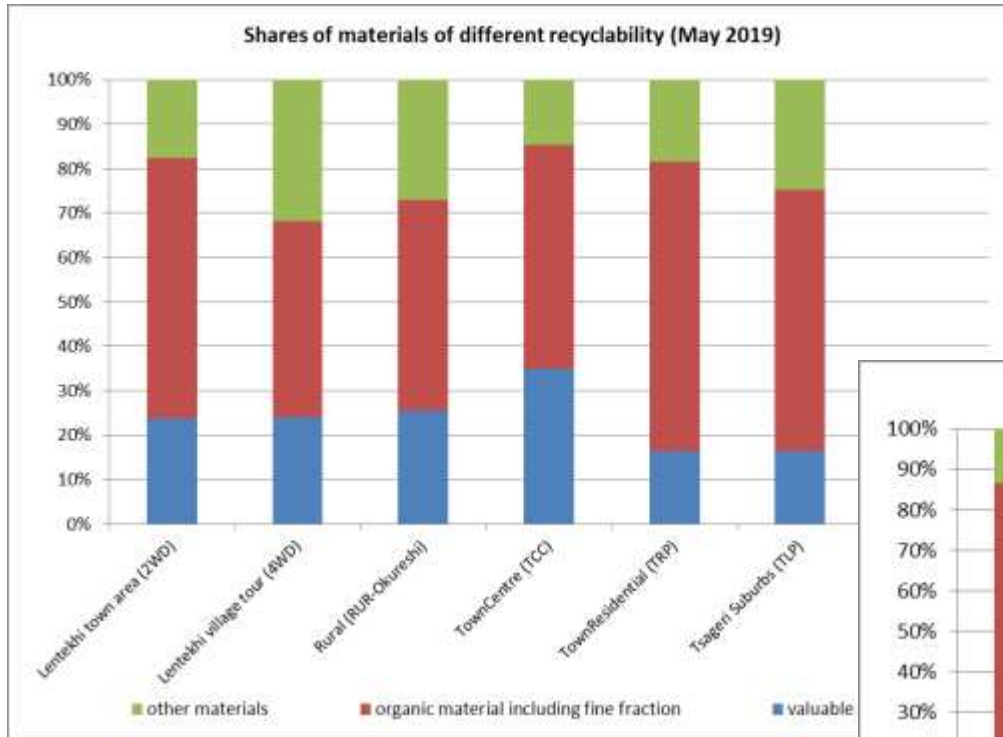- **Certain waste hot spots can be identified (e.g. diapers, clean paper)**

Results: Waste composition (II)
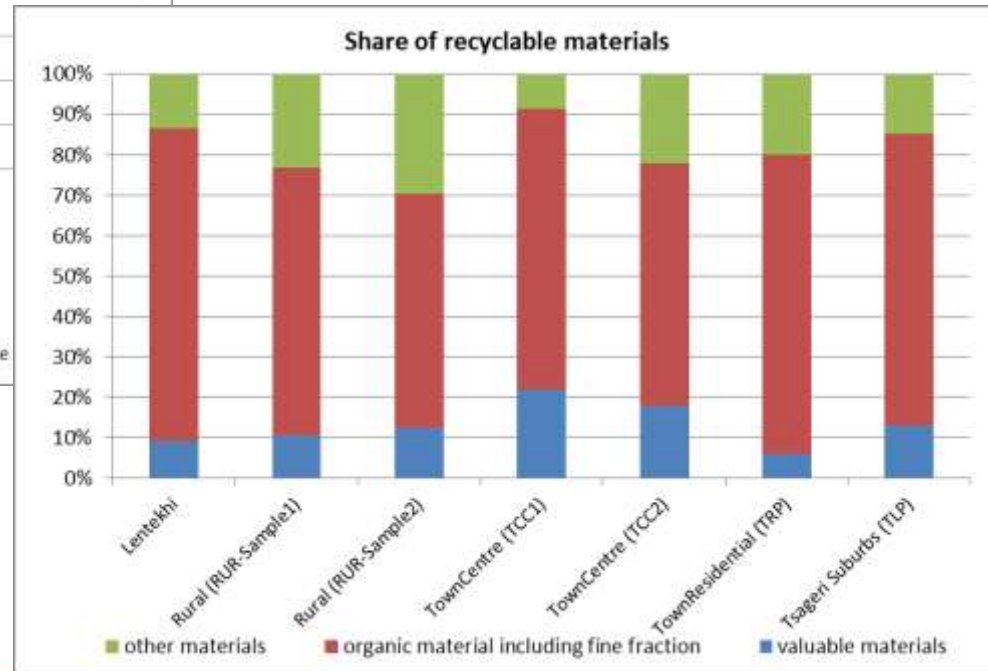## *Findings re. variation of overall composition*

Waste composition in the different territorial structures (May 2019)

2nd campaign (May 2019)

Waste composition in the different territorial structures

1st campaign (Sept. 2018)

Results: Waste composition (III)

Findings re. variation for fractions of different recyclability

Shares of materials of different recyclability (May 2019)

other materials · organic material including fine fraction · valuable

**2nd campaign
(May 2019)**

Share of recyclable materials

other materials · organic material including fine fraction · valuable materials
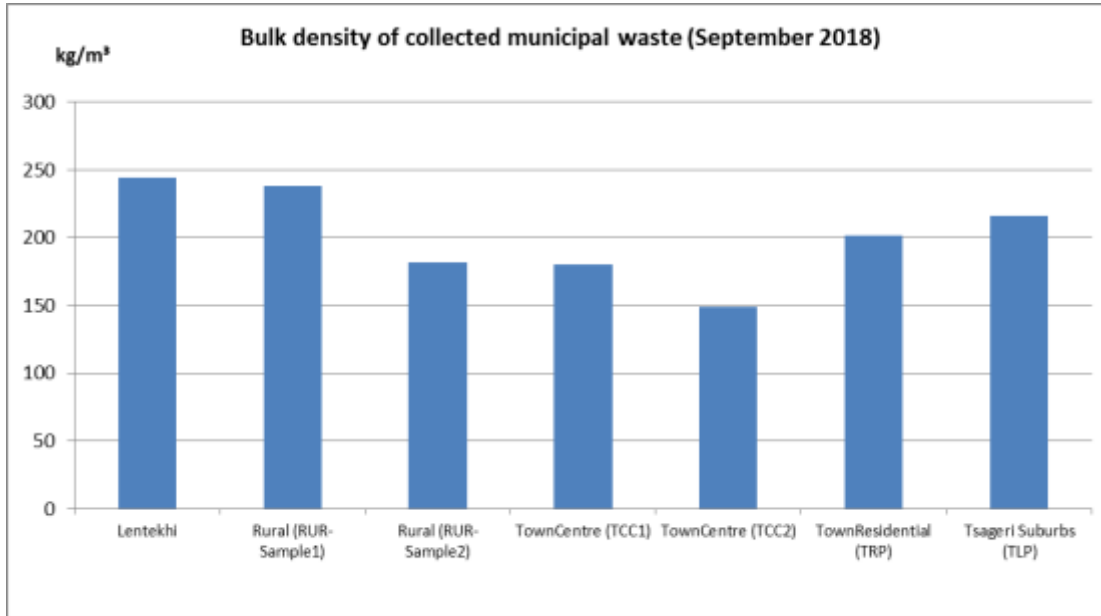
**1st campaign
(Sept. 2018)**

KFW

Results: Waste composition (IV)

Findings re. seasonal variation (composition)

Components	Autumn	Spring	Summer (peak s.)
Park/yard w.	higher than kitchen w. mainly clippings/fruits	lower than kitchen w. mainly weeds	?
Kitchen waste	lower than yard waste	higher than yard waste	?
Fines <30 mm	lighter (saw dust)	heavier (soil, dust, rubble)	?
Paper	nearly constant in the commercial centre almost doubles in the outskirt areas in spring		?
Glass	<3%	across all structures at least the double of autumn	?
Textiles	with 4-5% quite significant and constant		?
Dangerous w.	insignificant and rather constant (<1%)		?
Other waste	rather constant (6-7%) but clear hotspots in villages		?

Results: Waste composition (V)

Findings re. variations of density

Bulk density of collected municipal waste (September 2018)

Bulk density of collected municipal waste (May 2019)
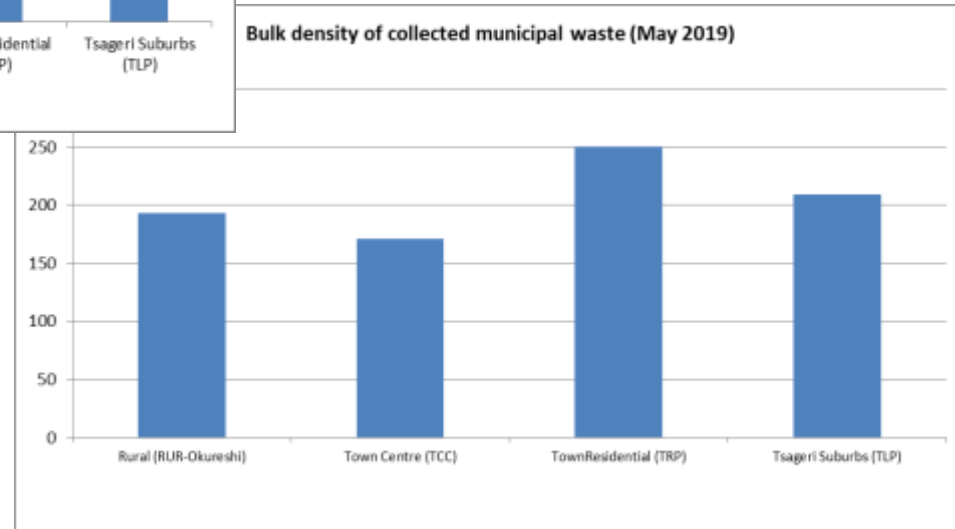
Results: Waste composition (VI)

Findings re. seasonal variation of total quantities

Development of landfilled amounts in TS jurisdictions
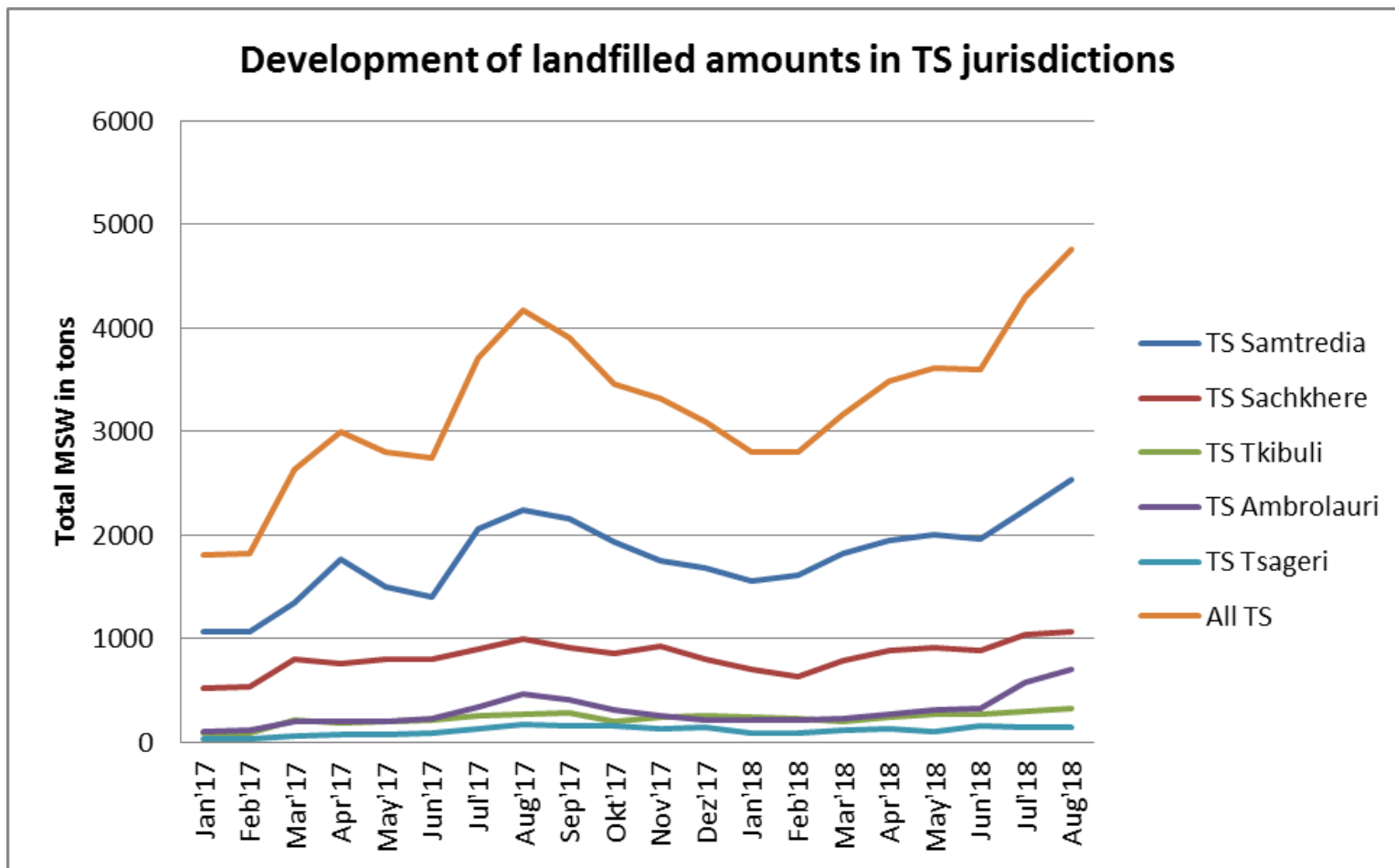
Some early conclusions from waste characterization

- **Working on the organic fractions will provide the most effective way to reduce waste amounts**

- **Considerable potentials for waste reduction at source, Municipalities should consider home and village composting as viable options**

- **Waste preventing practices be proposed and adopted for defined waste generation hotspots, e.g. kindergardens** *(example Lailashi)*

- **Separate collection best started in commercial centre area**
  - highest potential;
  - good infrastructure conditions;
  - target groups can be effectively address,
  - relative ease for social control and surveillance.

- **No large recycling potentials but paper and textile waste suit well for separate collection offers in rural structures**

- **It is worth thinking about useful additional service offers**
  (e.g. C&D waste, bulky items, reusable/refurbishable goods)

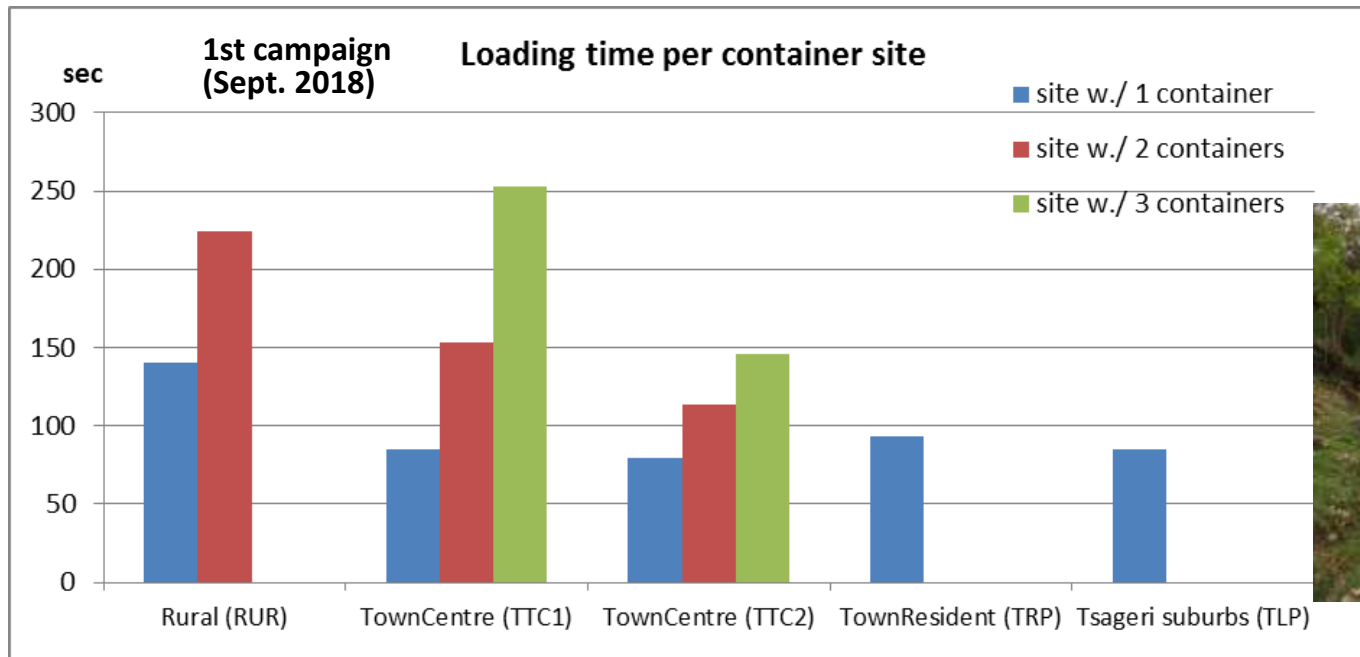# Results: Tour escorts (I)

Overall findings/assessment

- **Collection crews show <u>good performance</u> and devotion to standard practices (e.g. caring attitude) and safety rules**

- **Container distribution generally of good pattern but <u>pickup arrangements and frequencies must be reviewed and optimized</u>**

- **<u>Collection routes</u> are quite well and <u>purposefully arranged</u>, <u>monitoring</u> of tours <u>should be enhanced</u>**

- **Public acceptance of service system and rules is visible, <u>public contribution to caring use of equipment and efficient collection must not be overlooked</u> (enforcement measures, PR !)**

- **Benchmarking/training of crews could help to tap <u>additional efficiency reserves</u>**

- **<u>Hardware supply (for the current basic needs & conditions!) in the pilot area is generally at adequate level</u>**

Results: Tour escorts (II)

Findings re. tour parameters

- **Tour lengths varied between 30 and 100 km**

- **About 89 % of the container locations/sites are equipped with only 1 container**

- **Loading is generally more difficult in rural areas** (underground, hauling distances)*

*** By comparison to German practice there is a difference of 50% time delay in loading (potential reserves?)**

Results: Tour escorts (III)

Findings re. issues of technical nature

- **Lacking use respectively functionality of comb lifter**
  - ☞ *training or repair*
  - ☞ *devote attention in next procurement, harmonize container stock or tours*

- **Suboptimal lifter (speed, lifting angle) and steering mechanism for compaction process**
  - ☞ *devote attention in next procurement*

- **Container types (container lids, body strength of plastic containers, unifomity)**
  - ☞ *devote attention in next procurement*

- **Container site pofile/development state**
  - ☞ *upgrade underground at the site or enhance siting criteria/process*

Results: Tour escorts (IV)

Findings re. issues of technical nature / safety issues

- **Control devices (e.g. camera) and safety mechanism to prevent respectively stop backward movement whilst loader platforms are down are needed!**

☞ *We strongly advise:*

  ➤ *Place warning labels*

  ➤ *Instruct crews not to stay at platforms during backward driving*

  ➤ *Regularly inform on the danger*

  ➤ *Devote particular attention in next procurement*

Results: Tour escorts (V)

Findings re. efficiency parameters

- **Different tour segments reflect the specific conditions in the mountainous areas**
- **Optimization potentials are rather low**
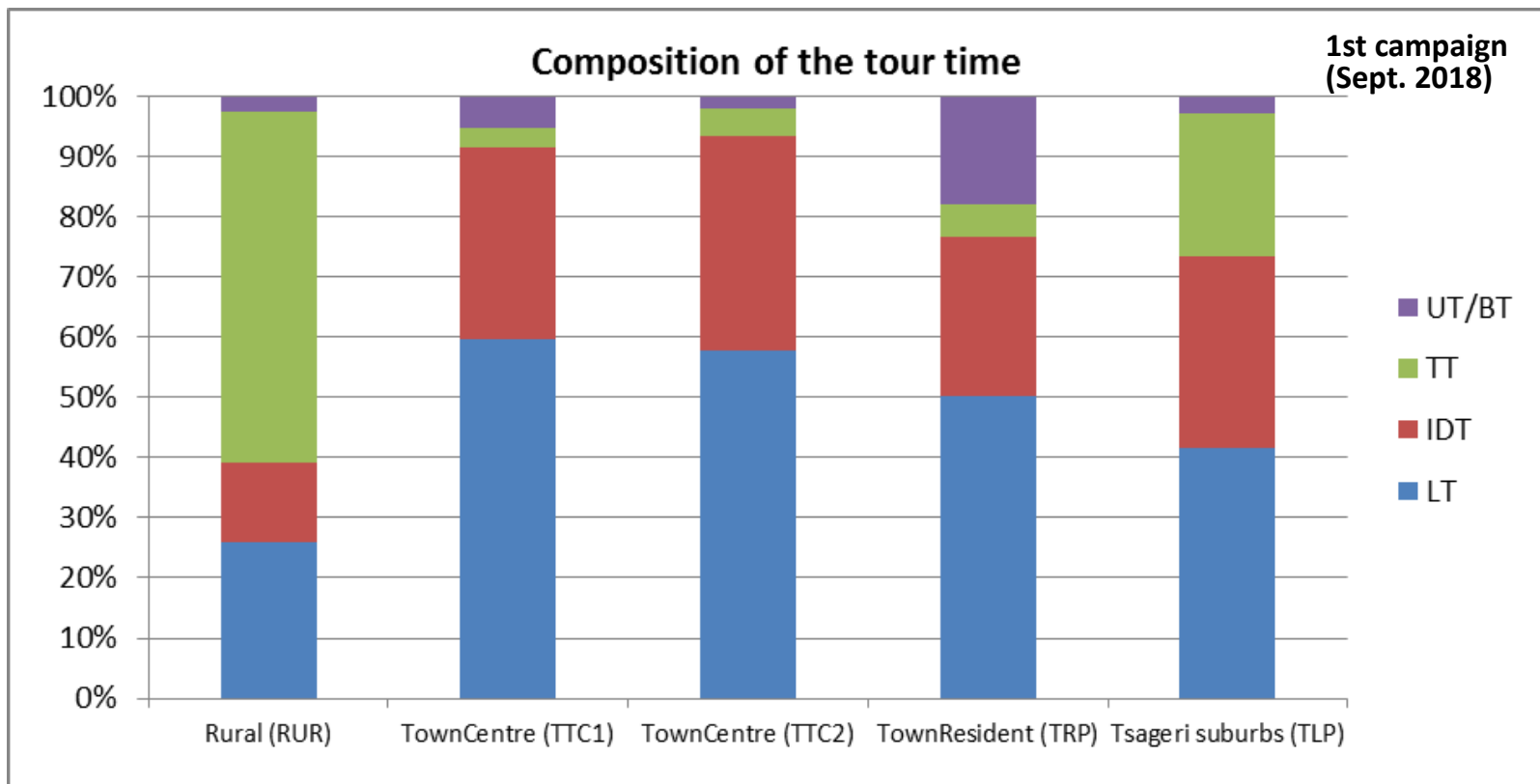
UT/BT=Unloading time/Break Time; TT= Transition time; IDT=Interim driving time; LT=Loading time

Results: Tour escorts (VI)

Findings re. efficiency parameters

- **Most <u>containers are filled significantly below capacity</u> at the moment of collection. Average filling levels across both campaigns stayed below 50%!**

- **Suburban parts with the least efficiency in terms of container capacity used**

- **Number of containers whose filling level reached at least 80 percent of the total capacity was found to be below 20 % (5-32%), overfilling very rarely happens.**

Container filling level — 1st campaign (Sept. 2018)

Container filling level (May 2019) — 2nd campaign
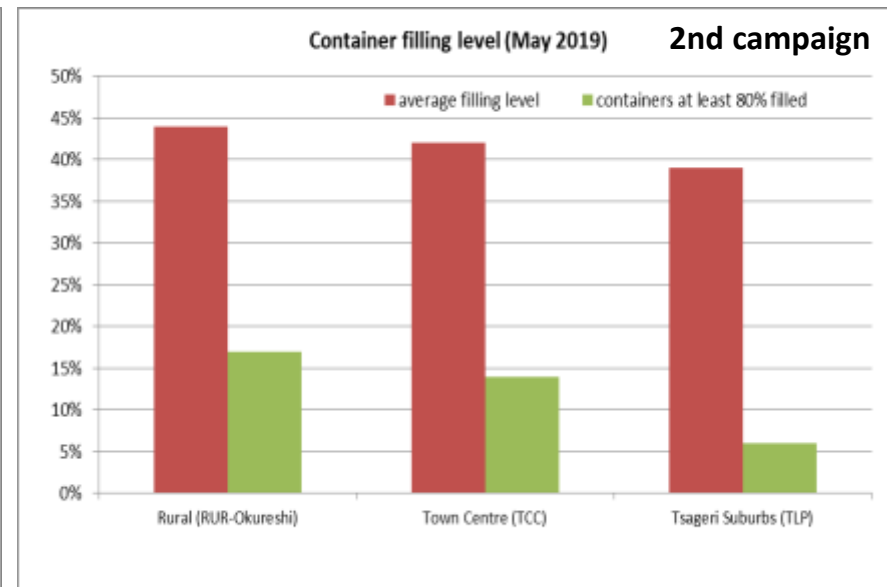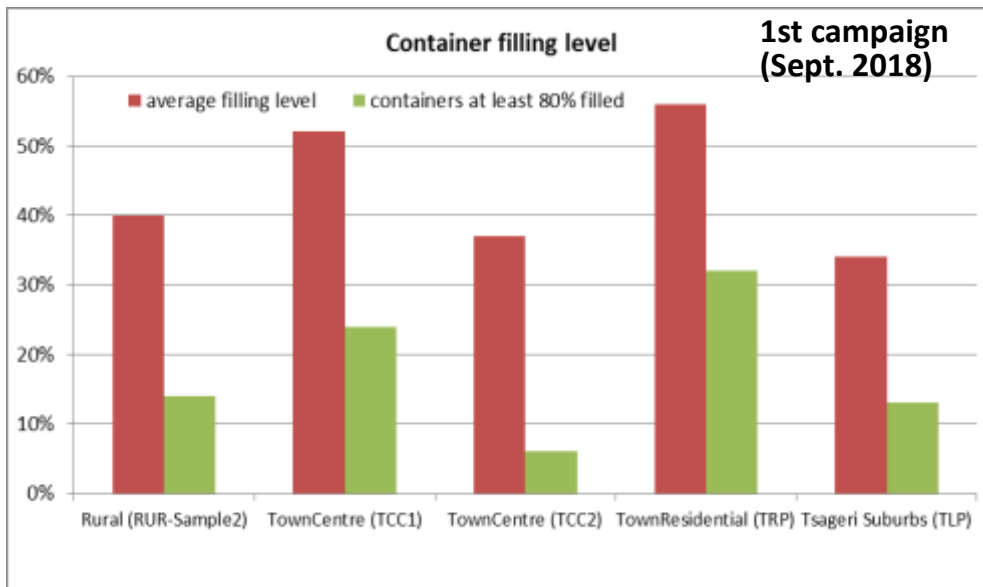
Some early conclusions from tour escort studies

- **Container supply is adequate but tour efficiency is showing optimization potentials, in particular considering used container capacity**
  (☞ get confirmation via further campaigns and <u>monitoring</u>!!
   ☞ when confirmed review container distribution & collection intervals _{-prolong!})

- **Technical optimization of the equipment would allow significant improvements**
  (☞ devote attention in next procurement)

- **Efficiency on rural tours be most tightly monitored, routine pickup of extremely remote containers** (e.g. Tvishi, Kulbaki) **should possibly be changed**
  (☞ search options to shift to bring or -on demand only- arrangements)

- **Efficiency can be further optimized by improving:**
  - container sites/siting *(☞ undergrounds, minimized need for reversing)*
  - compaction routines *(☞ training of loaders, attention in next procurement)*
  - uniformity of containers *(☞ harmonize container types on the tours,*
                            ☞ attention in next procurement)

<u>**Installing / improving monitoring will be extremely helpful for efficiency gains**</u>

Relevance of monitoring

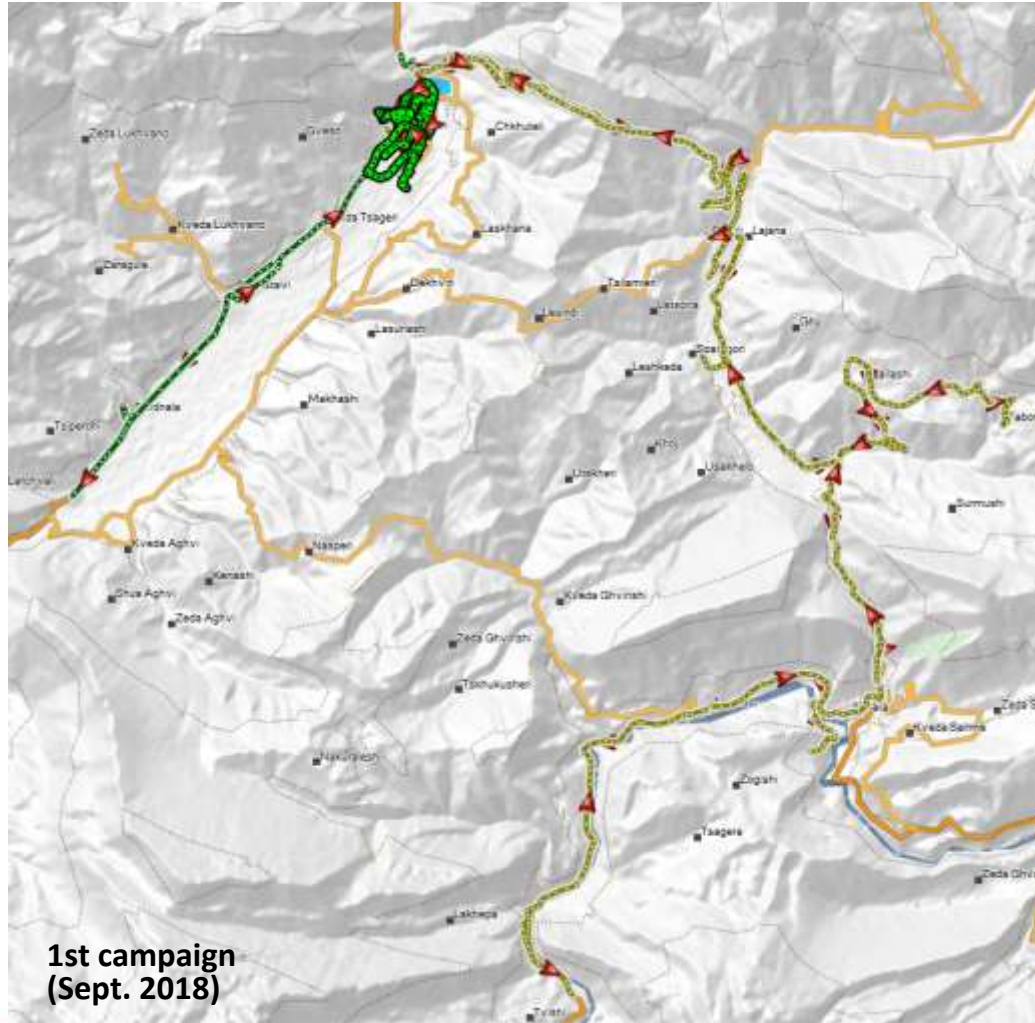## *Further study results confirming practical relevance*

Comparison of tour escort results (container number) Sept. 2018 and May 2019

	Total container recorded September 2018			Total container recorded May 2019	
	Sept. 15	Sept. 17	Sept. 18	May 4	May 6
Town commercial centre	69		96	78	
Town residential area	29				
	40			53	
		41			
					37

Development of container stock in TS jurisdictions
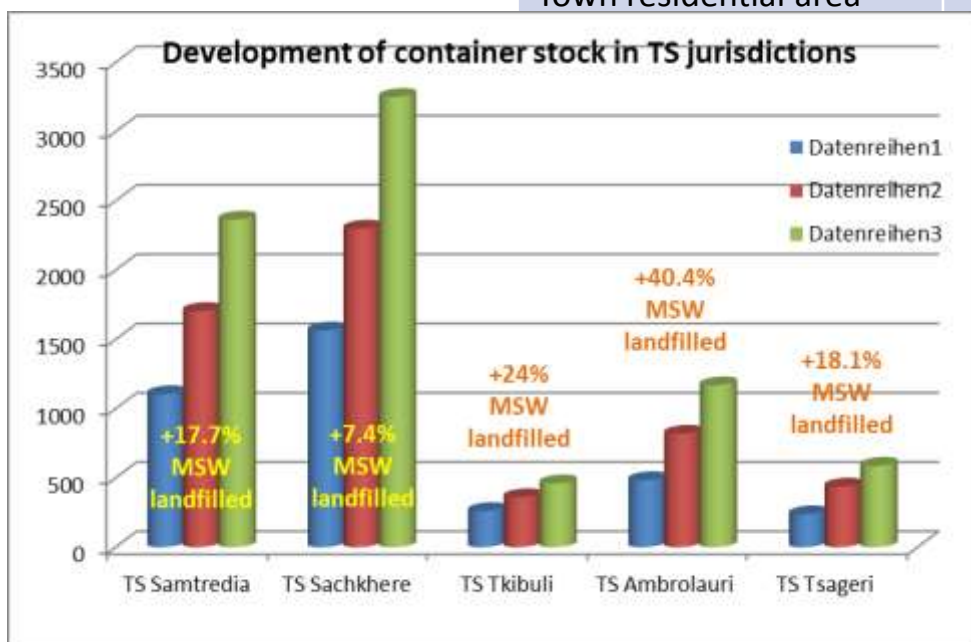
Helpful tools / Further recommendations (I)
GPS based tour mapping

2nd campaign
(May 2019)

1st campaign
(Sept. 2018)

Helpful tools / Further recommendations (II)

GPS based container site mapping
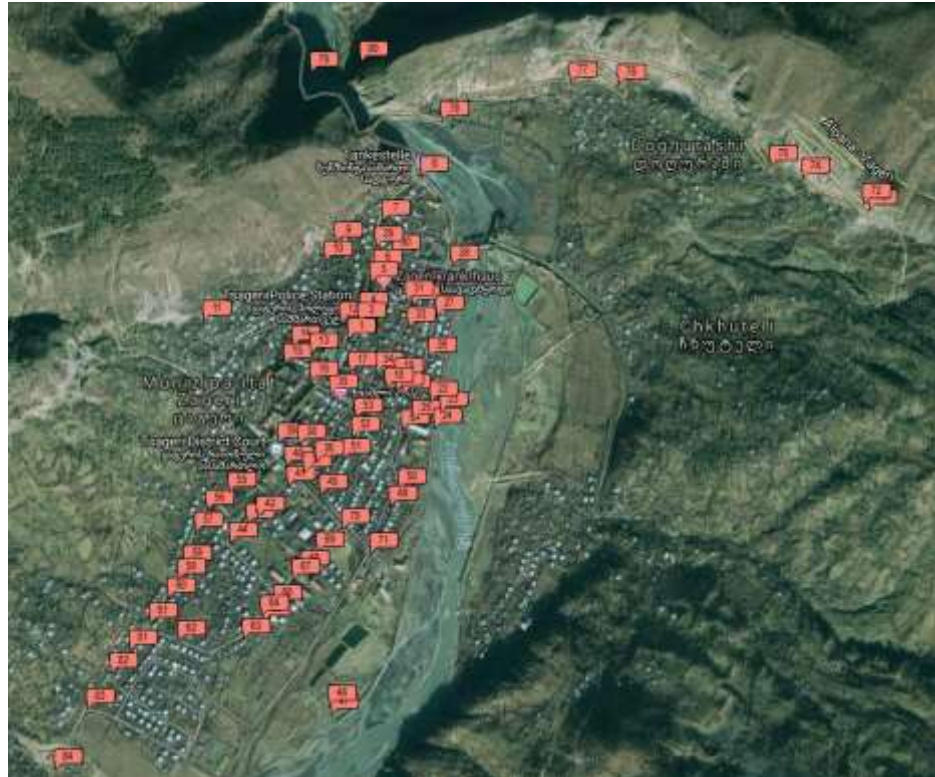
1st campaign (Sept. 2018)

2nd campaign (May 2019)

Helpful tools / Further recommendations (III)

Container site / container registry

It enables / the benefits are:

- **Ad hoc container monitoring/inventory** (numerical stock, physical state, location)
- **Monitoring of usage** (filling level, pollution, effectiveness of interventions)
- **Administration of site / container services** (cleaning, repairs, replacements)
- **Out sourcing of services** (Collection, Repair/replacement/cleaning services)
- **Tour and route planning** (Data basis and surveillance instrument)

Container-ID

Image of draft data base / excel tool

Continuation / Next steps

Who is going to follow and start implementing a pilot and some of the provided recommendations?

(1) Generation of information basis and monitoring mechanism
(e.g. tour data, container/site registry)

(2) Conduct of waste characterization
(current arrangements of joint landfill use could be an advantage; e.g. Oni-Ambrolauri, Sachkhere-Chiatura)

(3) Start piloting composting / recycling schemes
(e.g. high shares of compostable material,
paper as recyclable material with significant share, not necessarily under EPR)

Take particularly note of the good potentials for intermunicipal cooperation in all fields!