GUIDELINE

Methods of Calculating the Cost and Tariffs on Solid Waste Management

for Local Government Unit level in Albania

dldp
decentralisation and local development programme

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This is a consolidated version of the two separate manuals on cost and tariff, developed and piloted at LGU level during the period 2012-2013.
This version of publication is designed for the use by officials and experts at national and local level as a working document.

Content

Introduction

The financial management of the solid waste sector is a challenging issue. In this respect the decentralization and local development program –dldp, in the frame of improving the local governance through better service provisions supports the consolidation of the solid waste management sector at regional and local level in Albania.

The overall solid waste management legislative framework has been well developed since 2011, by the adoption of the framework law on Integrated Waste Management and the by-laws which are continuously developed, although it is yet to be strengthened and enforced. By 2013 the service itself is fully operated by the Local Government Units, while the legislative and regulatory framework is scattered in different levels of governance.

Presently (2013), costing the service and tariff management are not regulated or monitored by any authority, but by LGUs themselves in their best knowledge and capacities. Based on the support provided in last two decades by international agencies and capacities developed locally, the models applied for costing and tariff setting are varying in the different LGUs.

This guideline represents a consolidated approach on financial management of the solid waste service, which provides a good resource for the officials at national, regional and local level in Albania. It is developed as practical and ready to use tool, providing both professional and technical knowledge for the final user (in this case LGU officials).

The document is composed in two main parts:

- **Part I: Guideline on calculating the cost for Solid Waste Management**
- **Part II: Tariffs for solid waste management. A guideline for different models of Tariff Management for LGUs in Albania**

Both Parts guide the user on the developed Excel based system for Cost Calculation and Tariff Management (fully developed by the program but not included in this version of publication)[1]. They provide knowledge on the use of different variables and models, which can vary according different approaches in the organization of the service.

[1] The final Excel based developed systems for Cost Calculation and Tariff Modeling, will be distributed after has been fully endorsed and adopted by the national authorities.

Understanding these variations will serve to the LGU on calculating internal and external costs, use the best technology and make benefit of the cost recovery approaches.[2]

The guideline is based on the good international practice and knowledge and the Albanian reality in terms of data existence/availability and especially data development capacities. It takes in consideration the current country developments in several sectors which contribute in solid waste management.

[2] *Disclaimer*

The presented Cost Modeling and Tariff Modeling are developed as tools for helping LGUs on calculating the related costs for management and managing the tariff at local level.

The models must be used by professionals only, having received a specific training of the use and conditions of the models.

The results must be analyzed with a professional regard and experience before to take any conclusion or decision.

The authors assume that the results of the present model will not be used for a purpose other than agreed upon and may not be applied to another object, country or to changed circumstances.

The authors don't take any responsibility for any decision based on the results of any of the models, taken without their active participation. If a third party uses the results of the present model in order to take decisions, the authors disclaim any liability for any kind of direct or indirect (consequential) damages.

Any user of this manual is considered as having accepted these conditions.

PART I

Guideline on calculating the cost for Solid Waste Management *at Local Government Unit level in Albania*

1. General provisions of the calculation model

A standard waste management cost calculation system for a **single LGU** has to be based on the following overall clusters[3]:

- General data on the administrative area
- Capital Investments (trucks and bins required)
- Operating costs (maintenance, transport and personnel)
- Cost for landfill (gate fee)
- Amortization (re-invest) costs
- Administrative costs

All above clusters and related elements which populate them, are framed in the excel system attached to this guideline in a smart system, which is able to provide all related infrastructure, human and financial assets required for running the management system.

Each of this clusters are explained in details below, on their use and interactivity. The Waste Management Manager will be able to use the system and understand how is developed so to be able to interpret the results and to develop it further based on the changes in variables and standard costs.

Box: Before you start

Before you start using a cost management system, a set of data has to be collected, which relate to population, geography, road types and conditions (potentially a GIS map, or may use Google maps), truck types, bin types, actual fuel costs, salary system. A modern data collection would be based on benchmarking system, which can be developed in small-scale at local level. Waste management plan is crucial before starting to calculate costs, as it would provide most of the technical and infrastructure information required for the system variables.

Most data can be collected by referring to the existing national and regional strategies, databases, references and reports, while some of them, such as amount of waste per capita, road distances and conditions, number of waste producer units, have to be calculated and may require overviews and assessments.

[3] Further modeling can include: **Prevention,** amount of waste in percentage, which is reduced at source; **Reuse and recycle,** amount of waste which is channeled outside the overall cost system; **Remediation,** related to the closure of current dumpsites or other contaminated sites. The LGU might seek external funds or develop public-private partnership schemes to address these aspects.

1.1 General data on the administrative area [CLUSTER 1]

The purpose of this cluster is to evaluate the situation and assess needs for capital investments, operations, personnel and other administrative issues.

The main variables used for this cluster are: a) type of the LGU; b) no. of population, c) Visitors and tourists d) road distances, e) amount of waste produced.

Hereinafter, we provide an explanation of the variance of each variable:

a) **Type of LGU**. It considers the explicit division of LGUs into Urban, Rural. This variable is important for determining (based on National Waste Strategy and experience) the amount of waste produced, type of trucks, distances, personnel and all related costs to these.

b) **Population** (No. of inhabitants). A typical population of a LGU will consist of resident inhabitants and seasonal inhabitants (tourists/visitors) , which have to be considered separately. The number of residents can be estimated through the civil register. But there are examples of registered inhabitants, who are not actually living within the administrative area of the Unit (such as emigrants, students, etc.) and should not be considered in the calculation.

In the attached model, we deduct from the registered inhabitants those not living in the area by applying an average percentage, based on the knowledge of the LGU.

c) **Visitors and tourists** (No. of daily visitors). These waste producers have to be considered separately, since they are only present in a specific period of the year. The consideration of this population should be limited to LGUs for whom the touristic season has a significant impact on the waste management. These ones should provide the daily number of visitors and the months of the touristic season.

Box: Visitors and tourists

The calculation of the number of tourist/visitors, which can vary from thousands (historic, nature sites) to hundreds of thousands (sea side resorts, mass tourism), must be calculated separately, so not become a burden for households.

A separate system for managing the solid waste produced during the heavy touristic season has been developed to identify the related costs which should be billed to tourists. These costs are considered as additional costs.

d) **Road distance and conditions** (in km). Normally a collection truck has to visit all the administrative area (points of collections), by traveling around until the truck is full, then driving to the landfill and come back, which can relate to a shift or completion of the collection service. The road conditions are very important as this will primarily relate to the consumption and amortization costs and furthermore to the time spent for collection. Paved roads would improve the collection service very much. Distances to consider are:

1) Distance in collection to fill one truck
2) Distance in transport to go to the landfill when the truck is full, and come back

d) **Amount of waste produced** (kg/capita). This constitutes a real variable, which keeps updating based on the site verifications. Based on the studies, the amount of waste per capita varies from 0.6kg/capita in rural areas to 0.8-1kg/capita for urban areas. There are exceptions for the LGUs with very low number of population and located in very remote areas, where this number must be verified and can result lower than 0.3kg/capita, and for very urban areas, where this figure could be more than 1kg/capita.

All above figures relate to solid waste, not including hazardous, farming, debris and bulky waste, which have to be treated separately based on standards for operations.

As a first estimation, it is suggested to consider an average number of waste productions per inhabitant, embracing the whole production of the LGU, including the production of households, institutions and businesses.

The amount of waste per capita is the most important figure which affects the whole system. Therefore the LGU should verify the real production by weighing the waste based on a plan.

Tab. 1 - Use the table below to build this cluster of the cost calculation system ***[TC 1]***

Ref.	Figure name	Measuring unit	Use of the figure	Comments
A	**LGU Name**	*NA*	Indicative	NA
B	**Collection frequency** *(nb of collection per week)*	*number*	Exact number	This is calculated based on the amount of waste produced and is usually operated 2 or 7 days a week
C	**Type (Rural, Urban)**	*PA*	Text	Use Urban or Rural as by law. The difference between these types defines the variables and standards of operations.
D	**Population** *(registered/cencus)*	*number*	Exact number	Provide the number as by census, despite the factual number of whole year residents.
E	*% of population to be excluded (registered, but living outside)*	*%*	Exact number	The number of population excluded is usual emigrants staying for more than a half of the year outside the administrative area
F	**Population served** *(receiving/considered for the service)*	*number*	Variable	This is calculated by the formula **D-E.** Deducting the number of population excluded from the population by census.
G	**Road** *(distance from Landfill one way)*	*km*	Exact number	Usually the landfill remains the same for years.
H	**Road** *(distance during collection for one shift for one truck)*	*km*	Exact number	This is calculated based on the field measurements, by measuring the total distance covered by the truck until is

Ref.	Figure name	Measuring unit	Use of the figure	Comments
				full
I	**Waste produced per person standard**	kg/inh	Exact number	Use measured data or standards provided by the plans, but be vigilant to verify the consistency of the data
J	**Total waste produced**	*t/day*	Variable	Calculated by formula **D * I/1000** so to produce results in total per kg
K	**Total waste produced between 2 collections according to frequency**	*t*	Variable	Calculated by formula. If the collection is every day than the figure is equal with J, otherwise if the collection is 2 days a week, the amount of waste generated in the other days without service is accumulated.
L	**Total waste produced in a year**	*t/year*	Variable	Calculated by formula **J * 365 days**

1.2 Capital Investments [CLUSTER 2]

The purpose of this cluster is to establish the basic physical infrastructure of waste management (trucks and bins). This is based on the data gathered in the first cluster, which will address the need for collection and transport of the generated solid waste.

As a first step, we need to calculate how many trucks and bins are required to manage the waste properly. The purchase of these equipments represents the capital investment.

The variables used in this part of the system are: a) shifts b) waste collection truck; c) bins.

Starting from this cluster, it will be possible to calculate the operating costs (next chapter).

Here we provide an explanation of the variance of each figure:

f) **Shifts** (No.). This represents the number of "tours" a truck can do in one day, including collection and transport to the landfill (go and return), according to the quantity of waste to collect. It is usually more efficient to perform minimum 2 shifts with one truck.

a) **Waste collection truck type (tons) and price** (lek). The typical waste collection and transport trucks are self-compactor of 5t and 10t capacity. These trucks are suggested to be used based on the population of the unit. By default a rural area would use a 5t type while an urban one a 10t type. The number of trucks will vary based on the amount of waste to be collected, and the number of shifts considered for each truck. The actual loading capacity for a typical waste composition is about 85% of the total carrying capacity.

b) **Bins** capacity (ton) and price (lek). A typical bin would be a 1.1m^3 volume bin, which has a capacity of about 0.10 tons of solid waste, if we consider a general density for waste of 0.11 ton/m^3 . This density was measured in Shkodra during a weighing campaign in 2009 and is

subject to variation according to the waste composition. A bin capacity is depending on its size (volume, m^3) and on the specific density of waste in the bin. The given figures can be used as a first estimation. The number of bins needed is calculated considering a limited use to household waste. Other kind of waste like farming waste, demolition waste or any other "big" waste should be excluded and eliminated by the producers themselves.

*Tab. 2 - Use the table below to build this cluster of the cost calculation system **[TC 2]***

Ref.	Figure name	Measuring unit	Use of the figure	Comments
A	**Truck type**	*ton*	Exact number	Typically here will appear a truck type 5t or 10t. The use of this figure is indicative.
B	**Truck capacity**	*ton*	Exact number	Calculated 85% of the carrying capacity **(85% * A)**
C	**Shifts**	*number*	Variable	Calculated by formula. It considers the amount of waste produced **(T1C1-K)** and the truck capacity**,** for producing 1 or 2 shifts a day
D	**Trucks (quantity)**	*number*	Variable	Calculated by formula, considering the amount of waste produced and number of shifts. For large LGUs (more than 50.000 inhabitants) one replacement truck is necessary to keep operations ongoing.
E	**Bin capacity**	*ton*	Variable	Typical bin of 1.1 m3 can carry up to 0.10 t of solid waste. But the figure is subject of supervision as the type and density of waste determines the mass.
F	**Bins (total)**	*number*	Variable	Calculated by formula, considering the amount of waste to be collected and the carrying capacity of the bin.
G	**Truck costs** *(all trucks)*	*Lek*	Variable	Calculated by the formula, considering the price of one truck (the price comes from the market. It might be a new or a used one.) multiplied by the number of trucks
H	**Bins costs** *(all bins)*	*Lek*	Variable	Calculated by the formula, considering the price of one bin (the price comes from the market. It might be a new or a used one.) multiplied by the number of bins
I	**Total investment costs**	*Lek*	Variable	Calculated by the formula **(G + H)**

1.3 Operating costs [CLUSTER 3]

The purpose of this cluster is to calculate the costs related to the infrastructure maintenance (related to trucks and bins) and to the transport, including personnel cost. These are yearly costs and are important to keep separate because are strongly related to market changes and inflation.

The main variables used for this cluster are a) yearly days in operation; b) fuel cost

Here we provide an explanation of the variance of each figure:

a) **Yearly days in operation**. Considers the number of days in one year when the waste collection is performed. It depends on the frequency of collection (2 times a week or 7 times a week). This is highly related to the amount of waste to be collected. Basically if there is a production of about 3.5t of waste per day, there is a need for daily operations,. For those producing less than 3t/day the collection might be arranged one per 2 or 3 days, in which case an appropriate number of bins must be allocated to receive the waste produced. The model considers two options: 7 or 2 collections a week.

b) **Fuel cost**. Fuel costs highly influence the overall costs of the waste management. The fuel consumption must be highly supervised and a good plan of routing, efficient collection and transport is a must. In addition fuel is subject of international changes and country inflation. The administrators have to calculate the multiyear changes in the price of fuel and address it properly.

1.3.1 Maintenance costs [Cluster 3a]

The main variables used for this cluster are: a) truck maintenance; b) mechanical maintenance; c) parking.

Here we provide an explanation of the variance of each figure:

a) **Truck maintenance** (Lek). All vehicles are subject of regular maintenance required by the legislation, and related to oil change, tire change and other necessary maintenance works. The costs related to trucks are very high and a good maintenance plan must be part of the administrative manual. Furthermore, insurance and tax expenses have to be calculated yearly and integrated in this variable.

b) **Mechanical maintenance** (Lek). This is based on the truck working hours. The mechanical maintenance is closely related to road conditions and use of the truck during daily operations. A proper training and support must be provided to the operating staff so to ensure that these costs keep at the lowest level.

c) **Parking** (Lek). The LGU is suggested to use its own land to establish a parking station. There will be always costs related to parking maintenance, internal operations, guards, etc.

*Tab. 3 - Use the table below to build this cluster of the cost calculation system **[TC 3]***

Ref.	Figure name	Measuring unit	Use of the figure	Comments
A	**Truck insurance + tax**	*Lek/truck/year*	Exact number	The figure comes from the national tax standards for the type of truck
B	**Oil + filters**	*Lek/truck/year*	Exact number	The figure is determined by the type of truck and the use of the truck in km
C	**Tires**	*Lek/truck/year*	Exact number	The tire change depends on the consumption of the tires and might not be yearly.
D	**Mechanical maintenance**	*Lek/truck/year*	Exact number	The amount of money for the maintenance comes from experience.
E	**Parking**	*Lek/truck/year*	Exact number	The amount of money for parking is based on the parking management costs. If the LGU has its own land, can reduce the cost by having one park for all assets of all departments.
F	**Total maintenance costs**	*Lek/year*	Variable	Calculated by formula (**SUM=A:E) * number of trucks**

1.3.2 Collection and transport costs [Cluster 3b]

The main variables used for this cluster are: a) time spent; b) overall distances; c)fuel consumption

h) **Time spent** (hrs). There are two different variables used here: a) the time for spent for collection; and, b) time spent for transport to landfill. The use of these figures is different for urban and rural units, and by the type of truck. Typically for the collection time a 5t truck would need 3hrs to complete while a 10t type needs 4hrs. The time spent for transport varies on the distance to the landfill and speed of the truck. At the landfill the trucks would need an extra time to unload of an average 0.3 hrs/shift.

i) **Overall distances** (km). This calculates the distance in collection and distance to landfill. A good internal system would result very efficient to reduce the overall distances, so therefore, less time and less fuel. The internal routing of the truck is suggested to be studied well in advance, not to cross (if possible) same roads twice.

j) **Fuel consumption** (lt). The fuel consumption depends on the truck type and the operation times. By experience the consumption for collection for the trucks is respectively: for 5t type = 3l/hr; for 10t type 5l/hr. The consumption during transport for the trucks is respectively: for 5t type = 0.4l/km, for 10t type = 0.5l/km.

In order to be precise and to determine where are the main costs (and savings potential), it is advised to separate the collection costs (when the truck is being filled) from the transport costs (when the truck is full and going to the landfill).

Tab. 4 - Use the table below to build this cluster of the cost calculation system ***[TC 3]***

Ref.	Figure name	Measuring unit	Use of the figure	Comments
A	**Days in operation**	*days/year*	Variable	Calculated by formula, based on days in operation, which can be 365 or 108
B	**Time to load one truck at one time - Collection time**	*hrs*	Exact number (for one truck)	Figure based on type of unit (Urban 4hrs, rural 3hrs)
C	**Time collection (total)**	*hrs/day*	Variable	Calculated by formula (no. trucks * time/truck * no. of shifts)
D	**Time to unload in landfill**	*hrs*	Exact number	Comes from experience (0.3hrs), but improved by measurements
E	**Fuel consumption during collection**	*lt/day*	Variable	Calculated by formula, considering many factors, such as number of trucks, shifts, time for collection, time for landfill and the rate of consumption based on the truck type
F	**Total fuel consumed over the year for collection**	*lt/year*	Variable	Calculated by formula considering the rate of consumption and total time spent for all trucks for collection
G	**Truck speed**	*km/hrs*	Exact number	Depending on the type of truck and it's condition as well as road conditions
H	**Transportation time to landfill**	*hrs*	Variable	Calculated by formula based on the number of trucks, shifts and time spent going to landfill and unloading
I	**Total time spent for transport (one day/all trucks)**	*hrs/day*	Variable	Calculated by formula considering the number of trucks, shifts and distance to landfill * 2 directions
J	**Fuel consumption during transport**	*lt*	Variable	Calculated by formula considering the rate of consumption and total time spent for all trucks for transport
K	**Total fuel consumed over the year for transport**	*lt/day*	Variable	Calculated by formula, considering the total fuel consumed during transport * price of fuel per lt

1.3.3 Personnel Costs [CLUSTER3c]

The purpose of this cluster is to calculate all operation personnel costs, but being limited to only drivers and truck operators. This represents a very critical cluster of the system, a due diligent component, which must address the social aspects and responsible management.

The variables used in this part of the system are: a) personnel; b) working hrs; c) salaries.

Despite the service is in-house or outsourced, the personnel hired must be always supervised by the LGU service administrators to make sure that the company ensures operation efficiency (time, safety, task performance, etc.).

Here we provide an explanation of the variance of each figure:

a) **Personnel** (Number). This is composed by at least drivers and truck operators. A usual composition is one driver per car and two operators during collection, but in urban areas with more than 50,000 inhabitants there could be one extra worker, (which is not a good practice). the operators should not follow the truck to landfill. In large teams this scheduling will reduce the number of operators needed for the collection, thus reducing the costs.

In the attached model, the number of drivers and workers is calculated considering the number of shifts for one truck, and the legal limitation of working hours per day, and per week. In this scheme, two drivers would share one same truck (one driver could use it in the morning and the other one at night).

There is a need for support infrastructure for the personnel, which included uniforms, collection tools, cleaning chemicals, etc. These costs are part of the administrative costs and are calculated at the end of the calculation scheme.

b) **Working hours** (hrs). According to the country labor code, an employee must not work more than 48hrs per week, 8hrs of which are considered as higher paid ones as extra hours, and not more than 12 hours per day, 4 of which are considered as extra hrs. So to calculate the working hrs for the personnel the manager must be guided by the need of truck operation to remove the waste generated. The overtime must be avoided when possible, but a good balance between number of shifts, hrs per shift and total working hours for each staff, must be established. If not avoidable, extra costs must be calculated for extra hrs, or if very necessary hire personnel.

In the attached model, we consider maximum 8 hours per day and 40 hours per week, in order to avoid extra hours.

The working day of the personnel is composed by time for collection, transport, maintenance (cleaning the truck), reporting (daily diary) and meetings/trainings. For the calculation of the cost a distribution between truck operation and maintenance must be conducted.

In the attached model, we consider maximum 7.3% of time spent in maintenance works and an additional 7.7% for holidays time.

c) **Salaries** (Lek). The salaries are calculated based on the working code, to respect the minimum salary, the rest is subject of type of work and capacity. Combined to the working hours a salary must incorporate other tasks (other communal services) if the operations are once in three days or less than 4 hours per day for waste management.

Tab. 5 - Use the table below to build this cluster of the cost calculation system ***[TC 3]***

Ref.	Figure name	Measuring unit	Use of the figure	Comments
A	**Max working time**	*h/day*	Exact number	This figure is important for determining the number of personnel so to avoid overtime. Labor code is considered here.
B	**Max number of working days per week**	*days/week*	Exact number	This figure is important for determining the number of personnel so to avoid overtime. Labor code is considered here.
C	**Maximum weekly working time**	*hrs/week*	Exact number	This figure is important for determining the number of personnel so to avoid overtime. Labor code is considered here.
D	**Maintenance [% of working time]**	*%*	Variable	This figure is important for determining the number of personnel so to avoid overtime.
E	**Vacation [% of working time]**	*%*	Variable	This figure is important for determining the number of personnel so to avoid overtime
F	**Drivers quantity**	*Number*	Variable	Calculated by formula, considering the maximum time spent for one driver, limited by the shifts and labor code for maximum working hrs (A) and vacations.
G	**Driver salary** (all drivers)	*lek/year*	Variable	Calculated by formula, considering the gross salary for each driver * number of drivers in operation The driver's salary is subject of change by the administrator
H	**Workers quantity**	*Number*	Variable	Calculated by formula base on the number of drivers and a standard of 2 operators for truck.
I	**Workers going to landfill**	*Text*	Variable	This is important to be determined as Yes or No, as it recalculates the time spent by the workers and increases the time availability for workers. As a good practice, workers should not go to the landfill.
J	**Workers salary** (all workers)	*Lek*	Variable	Calculated by formula, considering the gross salary for each operator * number of operators in operation The worker's salary is subject of change by the administrator
K	**Total personnel**	*Lek*	Variable	Calculated by formula, considering total for drivers + workers

1.4 Cost for landfill (gate fee) [CLUSTER 4]

The purpose of this cluster is to calculate and maintain a separate calculation of this third party related cost. According to "waste" legislation each and every LGU must dispose the waste in a proper and safe way. The cost for waste landfilling is set as gate fee and is usually paid per ton.

The landfill costs are subject of change, based on the amount of waste going daily to the landfill and on change in operations. Therefore a good agreement, which will address the fee based on an appropriate business plan and extended in time, must be established.

The variables related to landfill costs are simple, based on gate fee per ton, which is calculated daily and yearly, for the sake of operations and setting the tariff.

*Tab. 6 - Use the table below to build this cluster of the cost calculation system **[TC 4]***

Ref.	Figure name	Measuring unit	Use of the figure	Comments
A	**Gate fee**	*Lek/ton*	Exact number	The gate fee is provided by the landfill operator/authority and is fixed by contract between parties
B	**Total cost for landfill**	*Lek/ton/day*	Variable	Calculated by the formula, considering the amount of waste sent to landfill daily * gate fee per ton
C	**Total cost for landfill**	*Lek/year*	Variable	Calculated by the formula, considering total waste produced per year (is all sent to landfill) * **B**

1.5 Amortization (re-invest) costs [CLUSTER 5]

The purpose of this cluster is calculating the costs needed for re-investment, so to keep the system working for a long time. It is a matter of system sustainability and will ensure a functional system.

The calculation is based on the Albanian legislation for amortization of equipments, which indicates a 5 year life span. This probably overestimates the amortization costs, as trucks are usually used on a longer period (10 to 15 years).

The variables in this cluster are simple and directly related to the yearly cost for amortization for the trucks and bins. This is added to the system as a percentage for year, which practically represents 20% of total amount of cost for the trucks and bins per year. It does not relate to the real amortization. The inappropriate use might shorten the life of the equipment and therefore significantly influence the cost for maintenance, investment and efficiency of the operation (time, fuel).

*Tab. 7 - Use the table below to build this cluster of the cost calculation system **[TC 5]***

Ref.	Figure name	Measuring unit	Use of the figure	Comments
A	**Truck amortization, years**	*Number*	Exact figure	This figure here will be 5 years, considering a standard average 20% amortization per year.
B	**Truck amortization cost**	*Lek/year*	Variable	Calculated by formula, considering number of trucks, price of one truck and the amortization rate per year
C	**Bin amortization, years**	*Number*	Exact figure	This figure here will be 5 years, considering a standard average 20% amortization per year. But, must be verified, based on the use (proper) of the bins.
D	**Bin amortization cost**	*Lek/year*	Variable	Calculated by formula, considering number of bins, price of one bin and the amortization rate per year

1.6 Administrative costs [CLUSTER 6]

The purpose of this cluster is to calculate the administrative costs necessary to run the whole system, develop strategies and policies, ensure efficiency and effectiveness, provide training and coaching, etc.

The administrative costs may include the necessary cost for tax recollection and for public awareness campaigns, which can be added separately to the system or be part of the overall administrative costs. This decision is taken based on the capacities and needs of the LGU. The system allows the use of both approaches.

In addition, a net income is calculated, which will be needed for new technologies, extension of the service and other not planned and immediate issues.

The variables here are simple and the figure is set by the local administrator based on the financial capacity. The figure is set in percentage of the total costs of the 6 clusters developed above. The experience suggests that these percentages are respectively: 9% for administrative costs; and 4% net income.

*Tab. 8 - Use the table below to build this cluster of the cost calculation system **[TC 6]***

Ref.	Figure name	Measuring unit	Use of the figure	Comments
A	**Administration fee** (total)	*%*	Fixed variable	Calculated by formula as **9%** of total operation costs
B	**Administrative cost for tax recollection**	*%*	Fixed variable	Calculated by formula as **xx%** of total operation costs
C	**Administrative cost for public awareness campaign**	*%*	Fixed variable	Calculated by formula as **xx%** of total operation costs
D	**Administration** *(of total)*	*Lek/year*	Variable	Calculated by formula (**%A+B+C * total operations)**.
E	**Net income**	*Lek/year*	Variable	Calculated by formula (**4% * total operations)**

By the end of this cluster, we can add two other rows for the scheme totals

1.7 Overall totals [CLUSTER 7]

This block provides a final presentation of total costs. Here we distinguish the cost required for investments for the first year of operations and the total bill per year for the waste management.

*Tab. 9 - Use the table below to calculate the total amounts of the management system **[TC 7]***

Ref.	Figure name	Measuring unit	Use of the figure	Comments
A	**Total investment (1 time)**	*Lek*	Variable	This value is equal with sum of purchase costs for trucks and bins.
B	**Total yearly costs**	*Lek*	Variable	This is calculated as sum of operating costs +landfill costs + administrative and net income costs + amortization costs. This sum represents the annual budget for waste management.
C	**Total operations + investments first year**	*Lek*	Variable	This is calculated formula (**A + B**) and represents the required financial capacity to start an operational waste management system

By listing all above tables as explained and link them with each other, we have developed a system of cost calculation. This system will inform the manager on the needs for investments, personnel, operations, amortization and other costs, so to be able to present cost estimation to the mayor and council of unit.

To keep the system up-to-date the fixed variables are kept in a different sheet, such as the road distances in one table, prices for the equipments, fuels cost, personnel salaries, etc. by doing so, the manager would change the figures in these tables and the system, being connected to these tables would update all figures and provide immediate results.

Here we provide an example how all these tables would form a complete, closed and functional system.

1.8 - Tab. 10 – Waste management cost calculation sample system

COST CALCULATION		
MODEL		
Base data		
LGU Name	Sample	
Collection frequency (nb of collection per week)	7	*2 options: 2 or 7*
Type (Rural, Urban)	Urban	
Population (registered/cencus)	113,350	
% of population to be excluded (registered, but living outside)	0%	
Population served (receiving/considered for the service)	113,350	
Road (distance from Landfill one way) [km]	16.0	
Road (distance during collection for one shift for one truck) [km]	15.0	
Waste produced per person standard [kg/inh]	1.0	
Total waste produced [t/day]	113.4	
Total waste produced between 2 collections [t] according to frequency	113.4	
Total waste produced [t/y]	41373	
Trucks		
Hypothesis : collection on all the LGU area, each day of collection		
Type of truck (types : 10t urban - 5t rural) [t]	10	
Fullness factor collection trucks [%]	0.85	
Truck capacity in tons (85% carrying cap) [t]	8.5	
Number of shifts per truck per day [shifts/d]	2	*1 or 2 shifts*
Number of trucks required	7.0	
Bins		
Hypothesis : collection on all the LGU area, each day of collection		
Weight of waste in a bin [t]	0.10	
Number of bins (1.1 m3 type-85% carrying per bin)	1102	
Operating costs (collection, transport, maintenance, personnel)		
Days in operation/YEAR (If less than 2t/day, coll. 2times/week)	365	
Fuel cost [LEK/L]	190.0	
Maintenance costs		
Truck insurance + vehicle tax [LEK/truck/year]	150,000 Lek	1,079 €
Oil + filters [LEK/truck/year]	90,000 Lek	647 €
Tires [LEK/truck/year]	160,000 Lek	1,151 €
Mechanical maintenance [LEK/truck/year]	200,000 Lek	1,439 €
Parking lot [LEK/truck/year]	200,000 Lek	1,439€
Total maintenance costs [LEK/y]	5,600,000 Lek	40,288 €
Collection and transport costs		

Collection costs		
Time to load one truck at one time - Collection time [h]	4	
Total time collection (no. trucks * time/truck * no. of shifts) [h/d]	56	
Time to unload the truck at the landfill [h]	0.3	
Proportion of total time for collection [%]	83%	
Fuel consumed during collection [L/d]	301.0	
Total fuel consumed for collection [L/y]	109,865.0	
Total cost for collection [/y]	20,874,350 Lek	150,175.18 €
Transport costs		
Truck speed [km/h]	60.0	
Transportation time to landfill [h]	0.5	
Total time spent for transport (one day/all trucks) [h/d]	11.7	
Proportion of total time for transport [%]	17%	
Total km of transport per day all trucks [km/d]	448	
Fuel consumed during transport [L/d]	202	
Total fuel consumed for transport [L/y]	73584	
Total cost for transport [/y]	13,980,960 Lek	100,582.45 €
Collection and transport subtotal costs		
Time landfilling (dist.*2/speed+unload 0.30 h) [h]	0.8	
Total time spent for one truck to complete in one shift [h/shift]	4.8	
Total time spend for collection and landfill (one day/all trucks) [h/d]	67.7	
Total fuel consumed [L/d]	502.6	
Total fuel consumed [L/y]	183,449.0	
Total fuel cost for collection and transport [LEK/y]	34,855,310 Lek	250,757.63 €
Personnel costs		
Max working time [h/d]	8.0	
Max number of working days per week [d/w]	7.0	
Maximum weekly working time [h/w]	40	
Maintenance [% of working time]	7.30	
Vacation [% of working time]	7.70	
Drivers		
Calculation based on daily needs:		
Drivers quantity based on daily needs (taking into account the limitation with shifts = can't change driver in the middle of a shift)	14	
Calculation based on weekly needs:		
Working hours per week / driver (without maintenance and holidays) [h/w]	*39.9*	
Weekly time considered on maintenance [h/w]	*2.91*	
Weekly time considered on holidays [h/w]	*3.07*	
Working hours per week / driver (with maintenance) [h/w]	*42.8*	
Total drivers needed (taking into account the maximum working time per week)	15	
Working hours per week / driver (without maintenance and holidays) [h/w]	37.3	
Weekly time considered on maintenance [h/w]	2.72	
Weekly time considered on holidays [h/w]	2.87	
Working hours per week / driver (with maintenance) [h/w]	42.8	
Monthly salary of the drivers [LEK/month]	27000	
Tax rate [%]	0.48	
Drivers salary (incl taxes) [LEK/y]	7,192,800 Lek	51,746.76 €
Workers		
Number of workers per team (1 driver, x workers)	3	
Total number of workers	45	

Workers going to the landfill (Yes/no)	yes	
Working hours per week / worker (without maintenance and vacation) [hrs/w]	37.25	
Maintenance and vacation [h/w]	2.23	
Working hours per week / worker (with maintenance and vacation) [hrs/w]	42.84	
Monthly salary of the workers [LEK(/month]	25000	
Tax rate [%]	0.48	
Workers salary (incl taxes) [LEK/y]	19,980,000 Lek	143,741.01 €
Subtotal personnel costs		
Personnel costs [LEK/t]	657 Lek	4.73 €
Personnel costs [LEK/inh/y]	240 Lek	1.72 €
Total Personnel costs [LEK/y]	27,172,800 Lek	195,487.77 €
Total cost (Maintenance, collection, transport, personnel)		
Operating costs per ton [LEK/t]	1,635 Lek	11.76 €
Operating costs per inhabitant/year [LEK/inh/y]	597 Lek	4.29 €
Subtotal Operating costs (Maintenance, collection, transport + personnel) [LEK/y]	67,628,110 Lek	486,533.17 €
Capital investment		
Trucks		
Waste collection truck unit price [LEK]	5,977,000 Lek	43,000.00 €
Waste coll. truck total for investment (large urban + 1) [LEK]	47,816,000 Lek	344,000.00 €
Bins		
Waste collection bins (1.1 m3) unit price [LEK]	35,000 Lek	251.80 €
Waste collection bins price total [LEK]	38,573,165 Lek	277,504.78 €
Subtotal capital investment [LEK]	86,389,165 Lek	621,504.78 €
Landfilling costs		
Landfill fee [LEK/t]	1,200 Lek	8.63 €
Total cost for landfilling (total ton * cost per ton) per day [LEK/d]	136,020 Lek	978.56 €
Total cost for landfilling [LEK/inh/y]	438 Lek	3.15 €
Total cost for landfilling (total ton * cost per ton) [LEK/y]	49,647,300 Lek	357,174.82 €
Amortization costs		
Trucks		
Truck amortization years [y]	5	
Truck amortization [LEK/y]	8,367,800 Lek	60,200.00 €
Bins		
Bins amortization years [y]	5	
Bins amortization [LEK/y]	7,714,633 Lek	55,500.96 €
Subtotal amortization costs [LEK]		
Total Amortization [LEK/y]	16,082,433 Lek	115,700.96 €
Total Amortization [LEK/t]	389 Lek	2.80 €
Total Amortization [LEK/inh/y]	142 Lek	1.02 €

Total costs			
Total operation costs (Maintenance, collection, transport, personnel, landfilling, amortization) [LEK/y]		133,357,843 Lek	959,408.94 €
Admin. fee (% of total cost), [lek/y]	9%	12,002,205.87Lek	86,346.80 €
Admin. fee for tax recollection (% of total cost), [lek/y]	0%	0	
Admin. fee for public awareness campaign (% of total cost), [lek/y]]	0%	0	
Net income (% of total cost), [lek/y]	4%	5,334,314 Lek	38,376.36 €
Total operation costs, incl. admin. Fee and income [LEK/y]		**150,694,363 Lek**	**1,084,132.10 €**
Total operation cost per ton (complete cycle) [LEK/t]		3,642 Lek	26.20 €
Total operation cost per inhabitant per year (complete cycle) [LEK/inh/y]		1,329 Lek	9.56 €
Investment			
Investment total cost		**86,389,165 Lek**	**621,504.78 €**

2. Presentation of the results

Waste management is a service and therefore subject to tariffs. As such, it must be addressed as cost to the producer. In order to understand the bill for the producer, we have to calculate the cost per treating one ton of waste and cost/inhabitant or cost/producer, so to develop a cost recovery analysis and strategy. Moreover, calculating the cost per inhabitant allows comparisons between municipalities.

For a better understanding of these costs it is suggested to make a calculation for each cluster separately. This would provide more information for the manager on clusters influence on the global budget, and on savings opportunities.

a) Calculating cost per ton

Basically **the cost to treat a ton of waste** is calculated as a division of the total cluster cost by total waste produced per year.

To do so, simply add a line below each cluster and use the formula to divide Cluster total amount with the total waste produced per year, which in our guideline corresponds to the **T1 C1 L**.

b) Calculating cost per inhabitant

Here we make use of the total population to get the costs for producer. Basically the manager will obtain the cost or burden of each cluster to each producer (in our case inhabitant).

To do so, simply add a line below each cluster and use the formula to divide Cluster total amount with the total number of population served which in our guideline corresponds to the **T1 C1 F.**

The results can be grouped in the main elements of the service, to understand the level of impact of each of them:

- Collection
- Transport
- Amortization
- Landfill

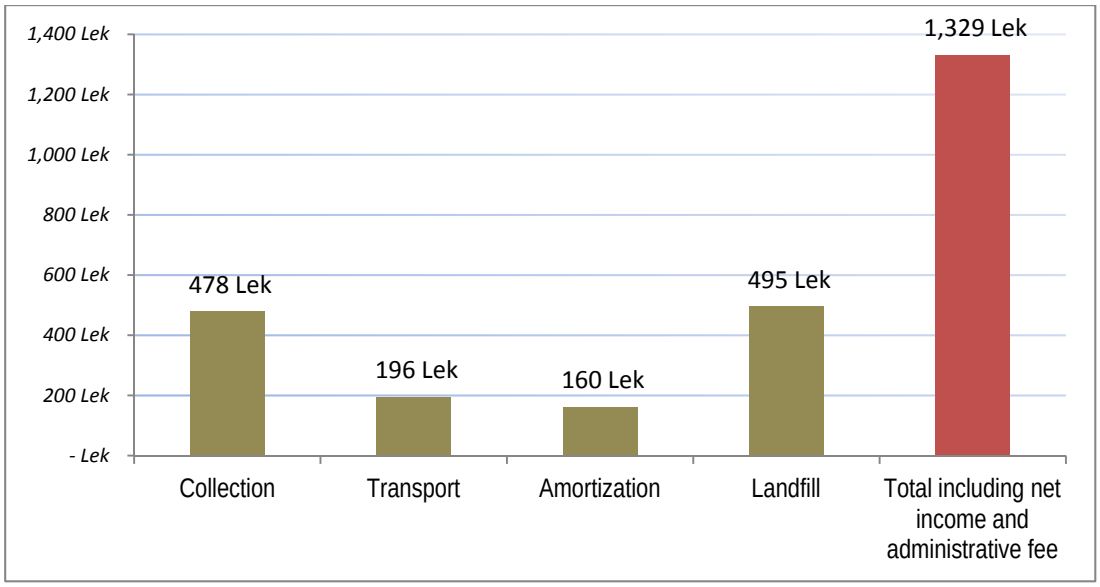
To do so, the manager must develop a table with the formulas explained in the table below.

Table 11 – Distributing the cost for inhabitants

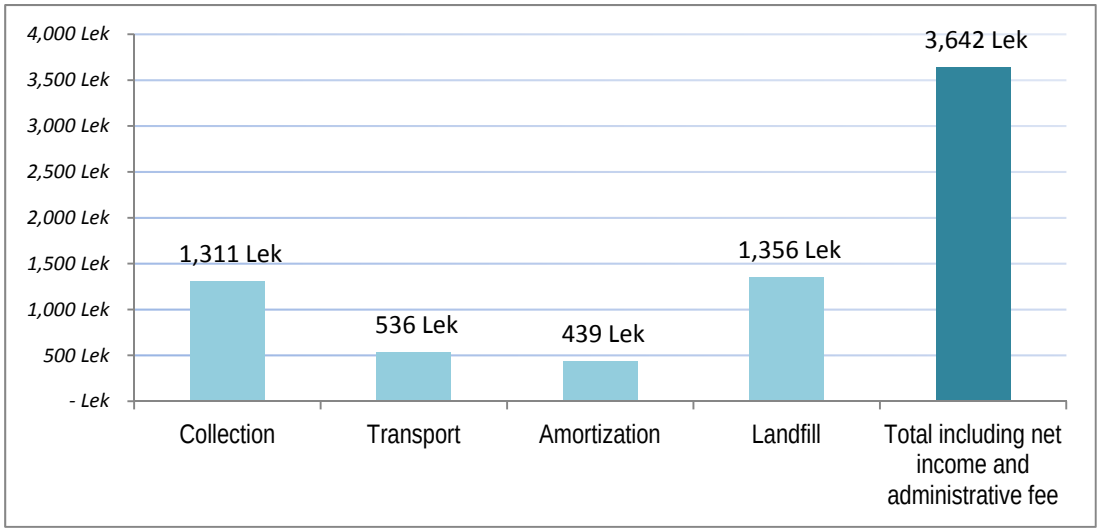
Ref.	Figure name	Measuring unit	Use of the figure	Comments
A	**Collection** *(includes collection, maintenance and personnel)*	*Lek/inb.*	Variable	This value is calculated by formula =(Total collection+maintenance+personnel) * (Percentage of administrative and net income) / Population
A1	**Collection** *(includes collection, maintenance and personnel)*	*Lek/ton*	Variable	This value is calculated by formula =(Total collection+maintenance+personnel) * (Percentage of administrative and net income) / Amount of waste generated yearly
B	**Transport**	*Lek/inb.*	Variable	This value is calculated by formula =(Total transport) * (Percentage of administrative and net income) / Population
B1	**Transport**	*Lek/ton*	Variable	This value is calculated by formula =(Total transport) * (Percentage of administrative and net income) / Amount of waste generated yearly
C	**Amortization**	*Lek/inb.*	Variable	This value is calculated by formula =(Total amortization) * (Percentage of administrative and net income) / Population
C1	**Amortization**	*Lek/ton*	Variable	This value is calculated by formula =(Total amortization) * (Percentage of administrative and net income) / Amount of waste generated yearly
D	**Landfill**	*Lek/inb.*	Variable	This value is calculated by formula =(Total landfill) * (Percentage of administrative and net income) / Population
D1	**Landfill**	*Lek/ton*	Variable	This value is calculated by formula =(Total landfill) * (Percentage of administrative and net income) / Amount of waste generated yearly
E	**Total cost including net income and administrative**	*Lek/inb.*	Variable	Calculated by formula (**A+B+C+D**)
E1	**Total cost including net income and administrative**	*Lek/ton*	Variable	Calculated by formula (**A1+B1+C1+D1**)

A graphic for a better visualization for the results is designed, which together with the table above, provide a simple but consistent sheet to be printed for use as reference by the LGU (see sample below).

Graph 1: Sample cost distribution for inhabitant per year



Graph 2: Sample cost distribution per ton waste per year



3. Calculating costs for tourism season

As explained above the tourists and visitors in some of the LGUs constitute significant impact on waste management operations and costs. The amount of waste produced in a short time, can vary from below to the total for the LGU to times more. Therefore, operations and costs are highly affected, thus producing a financial burden to the LGU.

As this amount of waste is not generated during the whole year, the costs related to the touristic season are strongly suggested to be treated separately and billed to the tourist by a strategy developed by the LGU.

For the calculation of these costs, the above developed system can be used, considering two variables:

- number of visitors per day (average per day of the total number of visitors from the previous year)
- official touristic season days (usually 30-90 days)

These two figures are added manually by the user of the system in the respective sheets (Data per LGU and Annex_Extra_Tourism).

After this the system will provide the costs only for touristic season.

PART II

Tariffs for solid waste management. A guideline for different models of Tariff Management for LGUs in Albania

1. Introduction

As a practical tool, it has been developed to support Local Government Units on understanding the tariff principles and methods of calculation. Three scenarios have been developed, each of them clearly described in the manual. The LGUs are expected to choose one of the models which best suits their capacities, potentials and conditions. The LGUs are expected to adapt/use it based on available data, as well as with their own political choices.

The development of the models has undergone a professional process and exercise process. It has been piloted and tested in 2013 in some LGUs within the *dldp* program area and actively discussed at national, regional and local level, with beneficiaries and experts, before being consolidated to a comprehensive system.

The tariff modeling is a tool to address Albanian Waste Management ambitions to promote financial sustainability and good practices of waste collection services as well as waste reduction and recycling. Considering the lack of tariff framework at all levels of governance, this model provides a high contribution on enhancing of the solid waste management framework in Albania.

This manual is developed in two main parts: The manual and The Excel Tool (not attached in this publication). Both parts are closely linked and cannot be used separately. The user must employ some excel skills and have a general knowledge of the local governance, data management and institutional cooperation.

It is important to note that the model is developed only for the solid waste tariff, not including the tariff for greening or any other added tariff, which is currently the practice in some of the LGUs.

1.1 Tariff Setting Principles

There are many different ways to define the tariff the producers have to pay for the waste services (for example based on electricity consumption, on the number of rooms in the house, on the volume of the building, on the value of the building, on the number of people living in the house, on the number of bins and frequency of collection, etc. None of them is perfect and all systems are subject to criticisms and can be declared as "unfair" for some users.

Developing the models and in general terms, setting the tariff is based in the main cost recovery principles:

- **Cost Recovery**: The waste management should be operated to ensure full cost recovery, which covers the Operation and Maintenance, Administrative costs and Amortization.
- **Polluter pays** (causality): the waste generator has to pay for its elimination as much proportionally as possible, for conducing to good practices, encouraging waste reduction, reuse and recycling and avoiding as much as possible the dumping of waste
- **Equity: similar conditions of** producers and waste production should pay as much as possible similar tariffs.
- **Equivalency**: the amount of collected tariffs should be close to the expenses (not under, nor over); The income can't be used for other purposes (road or pipes maintenance for example)
- **Transparency**: tariffs should reflect the costs and the citizens should be informed in a transparent way on the costs and tariff calculation.
- **Simplicity:** a very important element is defining a **system simple**, adapted to the affordable data, as cheap as possible in the cost of application (calculation, billing and collection) for the Municipality.

Respecting these principles must be the objective of tariff settings, although it could be limited by the data availability, among other causes. Thus, a compromise should be established between these different principles and the rationality of their application.

As much as possible, the system should be:

1. Based on existing data
2. Easy to establish and update
3. Appropriate for households, institutions and businesses
4. Appropriate for an integration in an existing invoicing system (if any)
5. Not a source of large additional administrative work

1.2 User groups/clients

As by categories of solid waste generation, the tariff will be defined differently for three main groups/clients, as follow:

1. Domestic/household,
2. Public/institutional, and
3. Private/businesses.

Each household (family), institution or business represents one unit, to whom the bill will be addressed.

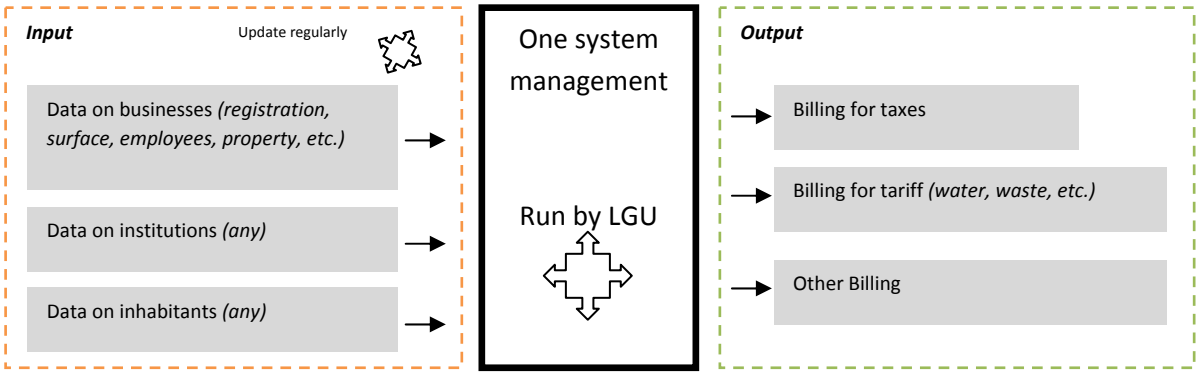
1.3 User of the manual / Implementation unit

According to the Albanian legislation (mentioned above) the solid waste management is a service administered by the LGUs within their territory of jurisdiction. Based on the same framework, the authority for the financial management of the service is the LGU. Therefore the user of this manual is the administration of the LGU.

Taking in consideration the capacities of each LGU, the tariff setting and use of this manual is associated with the tax office. However it shall be coordinated very efficiently with the service provision sector, department or unit, to keep updating the system and collect info on efficacy of implementation.

Best use of the system would be an integration of it into the tax system. Cross linking the information in the system, so data are entered once (e.g. name of the business, surface and employees) and used for different purposes, including the billing for solid waste services.

Here is an example of a system management scheme.



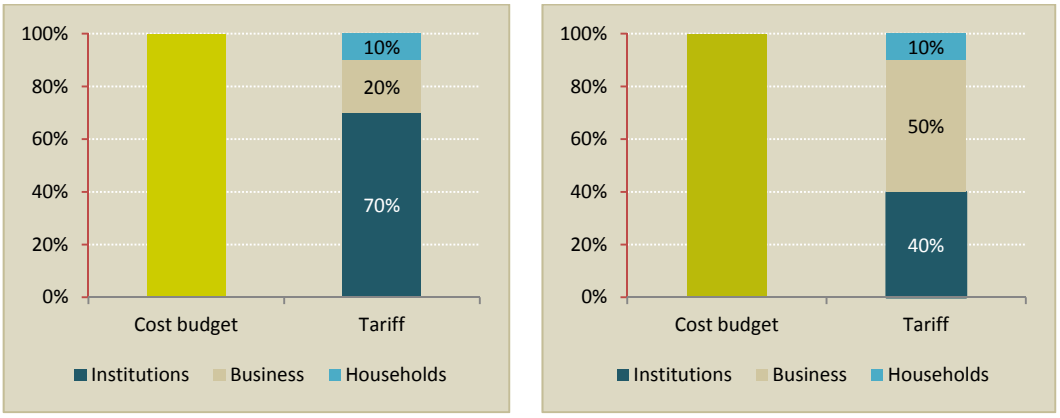
2. Developing the appropriate tariff system

There are different possible models, which all show advantages and disadvantages. The choice of the model is a typical political decision: Normally this is a responsibility of the Local Government Unit to propose a decision to the Council.

The choice of the model and his parameters will depend from different factors, like:

1. The specificity of the LGU: urban, rural, industrial, coastal, touristic, mountainous, etc. which will influence the types of waste producers.
2. The specificity of the waste production and collection in the LGU: the big producers can vary strongly from one to another: markets, businesses, industry restaurants, administration, agriculture, gardens, beaches, etc.
3. The repartition of the total tax effort between the different categories strongly depends of the local conditions and of the political approach. (*See the graphic examples*).

Graph. 1 – Examples of tariff repartition between groups



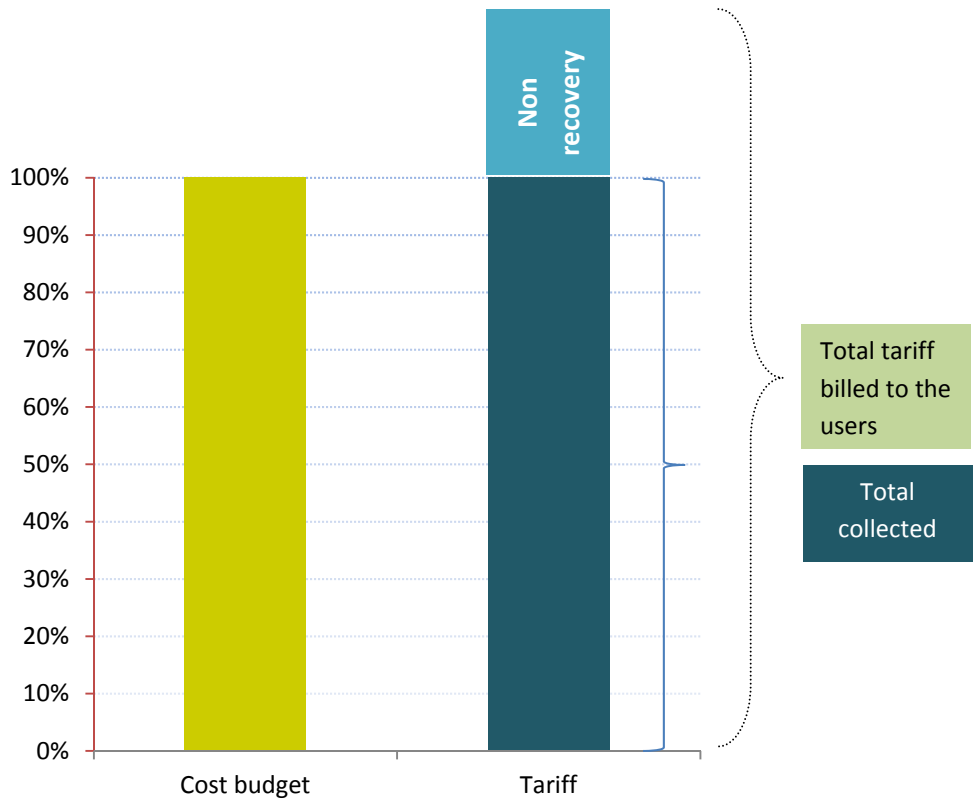
4. The political situation of the LGU and the political orientation of the authorities, elected by the citizen.
5. The financial situation of LGU.
6. The available data. *This criteria is probably the most important one.*

Whatever the chosen model might be, the calculation of the tariff is based on the value of the **annual budget** of the waste collection. A standard waste management cost calculation system for a single LGU is based on the following overall clusters (refer to the first part of this manual):

1. General data on the administrative area
2. Capital Investments (mainly required trucks and bins)
3. Operating costs (maintenance, collection, transport, personal, fuel)
4. Cost for landfill (gate fee) or other treatment or recycling activities
5. Amortization (re-invest) costs
6. Administrative and information costs

As an option, the total of the tariff should take in account the estimated amount of not recovered tariff (nonpayment rate). It must be part of the decision of the LGU to define which part of the cost should be covered by the tariff revenues, and which part will be cover by other LGUs revenues. In theory, the real amount of annually collected money should cover the real annual cost of the waste collection, in order to insure the sustainability of the service. This is illustrated by the following graph:

Graph. 2 – Tariff cost covering dynamics



In all the case, it is highly recommended choosing a model as simple as possible. The temptation of complicating the model trying to give it more equity can increase rapidly the cost of the day to day application, but on the other side it shouldn't reduce significantly the level of inequity.

3. Presentation of the models

This document presents three different possible models, which have been consolidated by piloting in the conditions of different LGUs in Albania, under the dldp program.

In summary the three models are as follow:

Model 1	**POPULATION/EMPLOYEES BASED MODEL**
Model 2	**PROPERTY SURFACE BASED MODEL**
Model 3	**PROGRESSIVE MODEL**

3.1 Population/employees based model

3.1.1 Model approach

This model represents a very simple approach. It assumes that the waste production is more or less proportional to the number of persons (inhabitants or employees), which is assumed to be an easy collectable data.

Basically the model is based on **the number of population or employees,** respectively in a household, business and institution. It has the aim to fully recover the costs of solid waste management.

The tariff is set for the three users categories, respecting a cost repartition chosen by the LGU. The distribution between the different categories depends on the local conditions and requires a political decision. The example presented in the chapter 2 of this manual can be used to support the decision.

The model offers the possibility for the potential exclusion of the households under the social aid scheme. The use of this deduction parameter is again a local political decision, as by law it is the local council which decides for a full exclusion, reduced tariff or inclusion of this group.

The model considers a non-payment rate for each category. In the provided model, the non-payment percentage increases the tariff for the regular payers. The decision to redistribute the costs to the regular payers is again a political decision. The LGU can use subsidies or other funds to cover this gap to avoid extra, unfair costs for the regular payers.

The model respects the main tariff principles at following level:

Principles	+	-
Polluters pay:	Each category of waste generation is considered in the model and weighted based on general waste generation.	The model has limited consideration of the real level of waste production of the different types of zones, businesses or institutions. In particular it doesn't consider the difference in waste production from a rich area or

		house and a poor area or house.
Transparency	It provides a clear tariff for each category and is efficient for households as it considers the number of family members for setting the tariff.	The user is billed based on one criterion only, despite the other factors.
Managerial Efficiency	Easy to develop and maintain : the data of inhabitants or employees still exists	The data of inhabitants are known as inexact or varying in the time. It is particularly the case in touristic areas

3.1.2 Necessary data

For the development of this model the following data from the respective sources are necessary:

Data	Potential source
Number of households	Census; Water Utility Clients; Social aid office
Number of individuals per each household	Census; Water Utility Clients
Number of businesses	Tax office
Number of employees for each business	Tax office *(In Albania the data are provided by the so called tax on income "Tatime")*
Number of institutions	Tax office
Number of workers/users for each institution	Tax office *(In Albania the data are provided by the so called tax on income "Tatime")*

3.1.3 Detailed presentation of the model (the *model in excel format*)

Table 1 – Model 1 elaboration (use of Data management table)

Base data	Value	Unit	Description
Cost budget			
Cost budget including amortization	*Number*	*Lek/year*	*Enter the total cost for waste management service for a year.*
Clients			
Households – no. of units	*Number*	*households*	*Total number of households as registered in census*
Households – no. of inhabitants or families	*Number*	*inhabitants*	*Number of family members for each of the households. This data is necessary for the calculation of the tariff per household.*
Public/Institutions – no. of units	*Number*	*institutions*	*Total number of public and private institutions within the LGU territory.*
Public/Institutions – no. of collaborators	*Number*	*col*	*Total number of registered employees or users of the institutions. (e.g. for a school, the total number of teachers,*

			administration and children registered)
Businesses/ industry[4] - no. of units	*Number*	*businesses*	*Total number of businesses despite the category.*
Businesses/ industry – no. of collaborators	*Number*	*col*	*Total number of registered employees for the above businesses.*
Cost repartition among categories[5]			
Domestic/Household	*Percentage*	*%*	*Add the percentage of tariff, which has to be billed to the households as a category. You may refer to the repartition example above.*
	Number	*lek/y*	*Calculated by formula to reflect the percentage of total costs covered for this category.*
Public/Institution	*Percentage*	*%*	*Same logic as per households*
	Number	*lek/y*	*Formula. Same logic as per households*
Business/ industry	*Percentage*	*%*	*Same logic as per households*
	Number	*lek/y*	*Formula. Same logic as per households*
Control total repartition	*Percentage*	*% ok*	*Sum of 3 above categories. Must be 100%*
Proportion of solvable clients[6]			
Households - % exclusion for social reasons	*Percentage*	*%*	*Add here the percentage of the families which are in social aid scheme. The value will be regulated based on the decision of the local council using the above mentioned logic.*
Households - % non payment	*Percentage*	*%*	*Add here the percentage of families which are not participating in the tariff system.*
Institutions - % non payment	*Percentage*	*%*	*Add here the percentage of institutions which are not participating in the tariff system.*
Businesses - % non payment	*Percentage*	*%*	*Add here the percentage of businesses which are not participating in the tariff system.*
Domestic/Household – no. of solvable units	*Number*	*households*	*Calculated by formula. It considers the percentage of repartition, deduction for social reasons and total non payment for the category. The result is the total number of households, which are expected to pay for the tariff.*

[4] Only businesses and industries that produce waste similar to municipal waste and are collected by the public service. It excludes hospitals, construction companies, and any unit producing hazardous or special waste which waste would be collected by other public or private company.

[5] Can be based on the proportional waste production, if known, or based on the repartition of people

[6] As a first approach, we can consider that the number of inhabitants or the no. of collaborators (employees) is proportional to the number of households, institutions or business. This number can be precised if more detailed data is available.

	Number	*inhabitants*	*Calculated by formula. It considers the percentage of repartition, deduction for social reasons and total non payment for the category. The result is the total number of inhabitants, which are expected to pay for the tariff.*
Public/Institution – no. of solvable units	*Number*	*institutions*	*Formula. Same logic as for households.*
	Number	*col. of institutions*	*Formula. Same logic as for households.*
Business/ industry – no. of solvable units	*Number*	*businesses*	*Formula. Same logic as for households.*
	Number	*col. of businesses*	*Formula. Same logic as for households.*
Calculation of tariff for each category			
Frequency of tariff	*Number*	*bills/y*	*Based on the decision of the LGU, to deliver the bill once in 6 months, or in a year, or else. Add here a number as frequency.*
Domestic/Household	*Number*	*Lek/inhab./bill*	*Calculated by formula. It provides the reference tariff for the category.*
Public/Institution	*Number*	*Lek/col./bill*	*Calculated by formula. It provides the reference tariff for the category.*
Business/ industry	*Number*	*Lek/col./bill*	*Calculated by formula. It provides the reference tariff for the category.*

3.1.4 Tariff calculation

Add as many rows as households, institutions and businesses are registered in the territory of LGU. Than go under each category and add the respective lists of households, institutions and businesses, **by adding for each of them the number of family members or the number of employees**. By doing so, the formula will work itself and calculate the tariff for each family, institution and business.

Table 2 – Model 1 elaboration (Tariff calculation table – linked with Table above) *(Example)*

Customer list	**Unit considered**	**Bill calculation**	
	[inhab] / [col.]	**[lek/period]**	
Households			
Family xyz	4	718	lek/bill
Family stu	2	359	lek/bill
…			
Institutions			
Institution I1	20	2857	lek/bill
Institution I2	80	11429	lek/bill
…			
Businesses and industries			
Business B1	3	469	lek/bill
Business B2	6	938	lek/bill

3.2 Property surface based model

3.2.1 Model approach

This model represents the same approach as for the first model limited to one factor. It assumes that the waste production can be estimate as proportional to the constructed surface of the property, which can be easily collected.

Basically the model is **based on the surface of property** for the categories: household, business and institution. It has also the aim to fully recover the costs of solid waste management.

The model converts all the information in square meters of property, to calculate the tariff for each individual family, institution and business.

The same logic of repartition, use of percentages for the calculation of the tariff, explained for the Model 1 is used for this model.

The model respects the tariff principles at following level:

Principles	+	-
Polluters pay:	Each category of waste generation is considered in the model and weighted based on general generation. The model considers that the waste production is proportional to the size of the houses which is proportional to the richness or the owners.	The model doesn't consider the real occupation of the building. In the time, one building can be used by a numerous family or a single person but the owner will pay the same tariff. Similarly, some business can produce a lot of waste in a reduce surface or very few waste in a large building.
Transparency	It provides the tariff repartition for each category. The tariff is clear and stable	The user is billed based on one criterion only, despite the other factors of waste production
Managerial Efficiency	Easy to develop and maintain. Data are usually available. The criterion of property surface is more stable and easy to control than the number of inhabitants	Data on household's property might be difficult to collect.

3.2.2 Necessary data

For the development of this model the following data from the respective sources are necessary:

Data	Potential source
Number of households	Census; Water Utility Clients; Social aid office
Surface per each household	Property Registration Office
Number of businesses	Tax office
Surface per each business	Tax office; Property Registration Office
Number of institutions	Tax office
Number of workers/users for each institution	Tax office; Property Registration Office

3.2.3 Detailed presentation of the model (the model in excel)

Table 3 – Model 2 elaboration (Data management table)

Base data	Value	Unit	Description
Cost budget			
Cost budget including amortization	*Number*	*Lek/year*	*Enter the total cost for waste management service for a year.*
Clients			
Households – no. of households	*Number*	*households*	*Total number of households as registered in census*
Households - total surface	*Number*	*m2*	*Total square meter of all households within the LGU.*
Public/Institutions – no. of units	*Number*	*institutions*	*Total number of public and private institutions within the LGU territory.*
Public/Institutions - total surface	*Number*	*m2*	*Total square meter of all institutions within the LGU.*
	Number		
Businesses/ industry – no. of units	*Number*	*businesses*	*Total number of businesses despite the category.*
Businesses/ industry - total surface	*Number*	*m2*	*Total square meter of all businesses within the LGU.*
Cost repartition among categories[7]			
Domestic/Household	*Percentage*	*%*	*Add the percentage of tariff, which has to be billed to the households as a category. You may refer to the repartition example above.*
	Number	*lek/y*	*Calculated by formula to reflect the percentage of total costs covered for this category.*
Public/Institution	*Percentage*	*%*	*Same logic as per households*
	Number	*lek/y*	*Formula. Same logic as per households*
Business/ industry	*Percentage*	*%*	*Same logic as per households*
	Number	*lek/y*	*Formula. Same logic as per households*
Control total repartition	*Percentage*	*ok*	*Sum of above categories. Must be 100%*
Proportion of solvable clients			
Households - % exclusion for social reasons	*Percentage*	*%*	*Add here the percentage of the families which are in social aid scheme. The value will be regulated based on the decision of the local council using the above mentioned*

[7] Can be based on the proportional waste production, if known, or based on the repartition of people

			logic.
Households - % non payment	*Percentage*	*%*	*Add here the percentage of families which are not participating in the tariff system.*
Institutions - % non payment	*Percentage*	*%*	*Add here the percentage of institutions which are not participating in the tariff system.*
Businesses - % non payment	*Percentage*	*%*	*Add here the percentage of businesses which are not participating in the tariff system.*
Domestic/Household - nb of solvable units	*Number*	*households*	*Calculated by formula. It considers the percentage of repartition, deduction for social reasons and total non payment for the category. The result is the total number of households, which are expected to pay for the tariff.*
	Number	*m2*	*Calculated by formula. It considers the percentage of repartition, deduction for social reasons and total non payment for the category. The result is the total m2, which are used to calculate the tariff.*
Public/Institution - nb of solvable units	*Number*	*institutions*	*Formula. Same logic as for households.*
	Number	*m2*	*Formula. Same logic as for households.*
Business/ industry - nb of solvable units	*Number*	*businesses*	*Formula. Same logic as for households.*
	Number	*m2*	*Formula. Same logic as for households.*
Calculation of tariff for each category			
Frequency of tariff	*Number*	*bills/y*	*Based on the decision of the LGU, to deliver the bill once in 6 months, or in a year, or else. Add here a number as frequency.*
Domestic/Household	*Number*	*Lek/m2/bill*	*Calculated by formula. It provides the reference tariff for the category.*
Public/Institution	*Number*	*Lek/m2/bill*	*Calculated by formula. It provides the reference tariff for the category.*
Business/ industry	*Number*	*Lek/m2/bill*	*Calculated by formula. It provides the reference tariff for the category.*

3.2.4 Tariff calculation

Add as many rows as households, institutions and businesses are registered in the territory of LGU. Than go under each category and add the respective lists of households, institutions and businesses, **by adding for each of them the respective surface of the property**. By doing so, the formula will work itself and calculate the tariff for each family, institution and business.

Table 4 – Model 2 elaboration (Tariff calculation table – linked with Table above) *(Example)*

Customer list	Unit considered	Bill calculation	
	[m2]	[lek/period]	
Households			
Family xyz	50	194	lek/bill
Mr stu	30	117	lek/bill
Mrs adc	100	389	lek/bill
…			
Institutions			
Institution I1	300	5357	lek/bill
Institution I2	500	8929	lek/bill
…			
Businesses and industries			
Business B1	250	1563	lek/bill
Business B2	60	375	lek/bill
…			

3.3 Progressive model

3.3.1 Model approach

This model represented a more comprehensive approach in tariff management. It includes more indicators of waste production and opens the possibilities of creating financial incentives for good practices. It needs however more data, and choices. It has been generated from the experience and model of the Albanian tariff management for water supply, using a billing factor criteria (see 4.3.3), which is calculated by a mix of several indicators.

The tariff is set for the three users categories, by not determining any previous cost repartition criteria. The distribution between categories is self adjusted based on the multi-criteria's given for each group of clients. Such criteria's, which are well described below and are: a) Garden; b) Size; c) Distance to city center; d) "Big" or special producer; e) Reduction measures (incentive) factor.

It has been consolidated based on piloting in some LGUs in the country[8]. **In this model, each client has to pay the reference tariff (billing factor = 1), which is increased based on the other factors explained later in this chapter.**

[8] The LGUs undergoing such piloting are Shkodra, Lezha, Dajçi i Bunes and Puka

The model offers the possibility for the potential exclusion of the households under the social aid scheme. The use of this deduction parameter is again a local political decision, as by law it is the local council which decides for a full exclusion, half tariff or inclusion of this group.

The model considers the total non-payment rate, but at accumulated percentage, by considering the amount of money not collected from the previous years as a total number. Same as above, the non-payment percentage increases the tariff for the regular payers. The decision to redistribute the costs to the regular payers is a political decision. The LGU can use subsidies or other funds to cover this gap to avoid extra, unfair costs for the regular payers.

All use of indicators and criteria's is further explained below.

The model respects the tariff principles at following level:

Principles	+	-
Polluters pay:	More detailed calculation of the tariff based on several indicators, which advances the understanding for the level of impact for each and every user. It provides incentives for wise waste management, by introducing the tariff reduction factor.	-
Transparency	It provides full transparency for the user, by producing a detailed bill. Several parameters are used to differentiate each client for the other. The tariff system can be used for information purpose.	-
Managerial Efficiency	Provides full range of information for the clients.	Requires a lot of data and efforts to maintain data updated. System to be run by trained professionals only.

3.3.2 Necessary data: reasons and content

For the development of this model the following data from the respective sources are necessary:

Data	Potential source	Reason
Number of households	Census; Water Utility Clients; Social aid office	To be listed as official clients
Number of individuals per each household	Census; Water Utility Clients	To be used within the size factor, this for families is number of family members.
Household property surface	Property Registration Office	To be used under the garden factor. The surface of garden for each property is a factor on tariff calculation.
Number of businesses	Tax office	To be listed as official clients

Data	Potential source	Reason
Business property surface		To be used under the size factor, this is m2 for businesses.
Business categories and activity	Tax office	To be used under the size factor, this is combined with surface factor to produce one single factor.
Number of institutions	Tax office; Education office	To be listed as official clients
Number of workers/users for each institution	Tax office *(In Albania the data are provided by the so called tax on income "Tatime")*	To be used under the size factor, this is number of employees/registered users for this category.
Address for each client (household, institution, business)	Urbanism office; Property Registration Office	To be used under the factor for distance from the center.

3.3.3 Detailed presentation of the model (the model in excel)

This model is based on the use of billing factor and coefficients for the calculation of the tariff for each client. As this tariff model is very innovative, the coefficients presented here are a proposal based on general appreciation, but not on law, regulation or examples.

The model uses two excel sheets to develop the database:

1. **The Data management** (Sheet 1) has three main tables, as follow: a) Define categories; b) Calculate size factor; and, c) Attribute billing factor.
2. **The tariff calculation** (Sheet 2) has two tables, as follow: a) Base tariff calculation; and, b) Client tariff calculation

3.3.3.1 Sheet 1 - Data management

Table 5: Step 1 - Define categories and parameters that will influence the tariff for each customer (="malus") – *formula system, not to be changed*

Tariff calculation factors													
Category		**Garden**		**Size****			**Distance to city center**			**"Big" or special producer***		**Reduction measures (incentive) factor (for application of legal and approved reduction measures)**	
		No	***Yes***	***Small***	***Medium***	***Large***	***0-5 km***	***5-10 km***	***>10km***	***No***	***Yes***	***No***	***Yes***
				1-3 pers.	***4-6 pers.***	***>6 pers.***							
Households		+ 0%	+ 100%	0%	+ 40%	+ 80%	0%	+ 20%	+ 40%	+ 0%	+ 100%	-0%	-20%
				1-15 empl.	***16-30 empl.***	***> 30 empl., per each adit.empl.***							
Institution		+ 20%	+ 100%	20%	+ 60%	+ 2.7%	+ 20%	+ 40%	+ 60%	+ 20%	+ 100%	-0%	-20%
				surf. of business : 0-50 m2	***surf. of business : 50-100 m2***	***> 100 m2, for each addit. 50 m2***							
Business cat. 1	**low prod.**	+ 20%	+ 100%	+ 20%	+ 40%	+ 20%	+ 20%	+ 40%	+ 60%	+ 20%	+ 100%	-0%	-20%
Business cat. 2	**medium prod.**	+ 20%	+ 100%	+ 40%	+ 60%	+ 20%	+ 20%	+ 40%	+ 60%	+ 20%	+ 100%	-0%	-20%
Business cat. 3	**high prod.**	+ 20%	+ 100%	+ 60%	+ 80%	+ 20%	+ 20%	+ 40%	+ 60%	+ 20%	+ 100%	-0%	-20%

**To be applied on businesses and institutions that produce waste similar to municipal waste (excl. Hospitals, construction or industrial waste)*

***Can't exceed + 900% (roof 345 employees and 2250 m2)*

3.3.3.2 Sheet 1 – Calculate size factor

Table 6: Step 2 – Sub table to calculate the size factor – *formula system, not to be changed*

Category	Size			Comment
	Small	***Medium***	***Large***	
	1-3 pers.	***4-6 pers.***	***>6 pers.***	
Households	0%	+ 40%	+ 80%	
	15	***30***	***> 30 empl., per each ad. employee***	According to ADEME studies (France), the waste production of 1 employee represents 20% of the domestic waste produced by 1 person. => 5 employees = 1 person of a family
Institution	+ 20%	+ 60%	+ 2.7%	From small to medium = +40% for 15 person = +2.7% per person
	50	***100***	***> 100 m2, for each addit. 50 m2***	
Business cat. I	+ 20%	+ 40%	+ 20%	Category 1: Services, free professions, ambulant[9]
Business cat. 2	+ 40%	+ 60%	+ 20%	Category 2: Retail shops, wholesales, transport
Business cat. 3	+ 60%	+ 80%	+ 20%	Category 3: Production

[9] The distribution of the businesses within the categories has been based on the Albanian legislation for taxes, by combining the business category and activity and the waste management experience on the amount of solid waste generated by a category of business.

3.3.4 Explanation of the factors used in the tables above and their usage

a) Garden factor

The introduction of this factor comes from the observation that has been made in urban LGUs (e.g. Shkodra), where an important fraction of the waste is vegetal, coming from individual gardens. Eliminating this vegetal waste, that is very voluminous, costs a lot to the municipality. This additional cost should be supported by the owners of gardens. That's why the example proposes to double (+100%) the tax to the producers who have a garden. The use of this factor provides a progressive approach to establish a communication with the community and, combined with the incentive factor (application of legal and approved reduction measures), provides an incentive for composting and other solutions.

Regarding this factor, the LGU should consider the following:

- What is the proportion of vegetal waste coming from gardens in the municipal waste?
- How does it influence the cost of the service (collection, transport and disposal)?

The model proposes the following influence of the garden factor on the tariff calculation, but the proportions can be adapted by each Municipality:

Category	**Garden**	
	No	**Yes**
Households	+ 0%	+ 100%
	-	Garden = high waste production
Institution	+ 20%	+ 100%
	Support measure	Garden = high waste production
Business	+ 20%	+ 100%
	Support measure	Garden = high waste production

A basic +20% is applied on the tariff calculation of institutions and businesses, considered as a support measure to the population.

b) Size factor

This factor assumes that the quantity of waste produced is influenced by the size of the producer. The consideration of the size is calculated on different ways for the different waste generators.

Households

The waste production is proportional to the number of people living in the households. 3 categories are proposed.

The model proposes the following influence of the size factor on the tax calculation :

Category	**Size**		
	Small	***Medium***	***Large***
	1-3 pers.	***4-6 pers.***	***>6 pers.***
Households	0%	+ 40%	+ 80%

The coefficients have to be defined by the Municipality, according to local conditions and policies.

Institutions[10]

The categories have been defined according to the number of employees, based on the categories defined for the households (5 employees are considered as 1 person of a household). *These categories could be changed according to the local knowledge of the institutions.*

As for the other factors, a basic +20% is applied on the tariff calculation for all institutions. For the medium size, an additional +40% is applied and for the large size +2.7% for each additional employee when the institution is more than 30 employees.

Category	Size		
	Small	Medium	Large
	1 – 15 pers.	16-30	> 30 empl., per each ad. employee
Institution	+ 20%	+ 60%	+ 2.7%

A roof of +900 has been determined (regulated by formula), in order to avoid that this factor leads to a billing factor higher than ten times the basic billing factor. It means that over 345 employees, the size factor wouldn't grow higher. The option of limiting the billing factor to a roof is open to the choice of the LGU.

Businesses

3 categories have been defined, based on the law on local tax[11][12]:

Category 1 – Low waste producers: services, free professions, ambulant

Category 2 – Medium waste producers: retail shops, wholesales, transport

Category 3 – High waste producers: production

Here the coefficient is based on the surface (of only building or market, not

[10] According to ADEME studies (France), the waste production of one office employee represents 20% of the domestic waste produced by 1 person

[11] Law No.8978, date 12.12.2002 "For local tax on small business", as amended

[12] Ministry of Finance Order No. 4, Date 27.01.2003 'On local tax on small business"

garden or surroundings) used by the business. *The basic unit is 50 m^2, which could be changed according to local knowledge*.

As for the other factors, a basic +20% is applied on the tariff calculation for all businesses. , +40% for the cat. 2 and +60% for the cat.3 is applied. Then, the coefficient is growing +20% for each additional 50 m2.

Category	**Size**			
	Small		***Medium***	***Large***
		surf. of business : 0-50 m2	***surf. of business : 50-100 m2***	***> 100 m2, for each addit. 50 m2***
Business cat. 1	**Low. prod.**	+ 20%	+ 40%	+ 20%
Business cat. 2	**Medium. prod.**	+ 40%	+ 60%	+ 20%
Business cat. 3	**High. prod.**	+ 60%	+ 80%	+ 20%

A roof of +900 has been determined, in order to avoid that this factor leads to a billing factor higher than ten times the basic billing factor. It means that over 2,250 m2, the size factor wouldn't grow higher. The option of limiting the billing factor to a roof is open to the choice of the LGU.

c) Distance factor[13]

Disseminated constructions are a source of high expenses for the public services, including waste management. The idea of this distance factor is to reflect the additional cost for the community on collection and transport. However, the distance is not related to the waste production and the producer has no influence on it. That is the reason why the proposed coefficients are not very high (+20% for each step).

Regarding this factor, the LGU should consider the following:

- Categories and coefficient should be adapted to the scale of the LGU
- What is the policy of the LGU regarding territory management? Is there a willingness of centralization? I yes, coefficients could be higher.
- How do distant waste producer influence the cost of the service (collection, transport and disposal)?
- Consider that some low revenue clients might be distant due to

[13] The distance means the distance from the city/commune center and refers to the **direct measured distance** from there to the client, not the total km covered by the truck to the destination.

	several reasons, including economic (remote villages). - Special consideration for the clients that would be out of the service area, or badly deserved (tariff reduction or exclusion).
d) Big producer factor	This factor is more relevant for businesses and institutions than families. It has been introduced to compensate the situation where the producer has no garden, rents a small building with few employees, in the city center, but produces big amount of wastes, due to some special activity. According to the garden, size and distance factor, this waste producer would pay the lowest tax. This factor gives the possibility to the LGU to adjust the tariff. As a technical and political decision, the LGU should consider the following: - Decision of defining a producer as big is a specific and autonomous decision of the Municipality for each particular case, based on the knowledge of the producers in the LGU. It is also an instrument of incentive for forcing good practices. - Compared to other businesses or institution of the same range (in term of size), how much more waste do they produce? 2, 5, 10 times more? This could be a base to choose the coefficient.
e) Reduction measures (incentive) factor	This factor gives the possibility to lower the tax of the producer who applies legal and approved waste reduction measures, validated by the municipality. The Municipality could propose a list of measures that should be applied to benefit of this factor, as per example: - To separate paper/cupboard and PET/plastics and to put it in the street only the day indicated by the Municipality (in the case where the Municipality organizes) - To produce its own compost - To use exclusively other private solution <u>! Getting the information could be complicated and time consuming!</u> It is considered difficult to reduce much more the tax, based on measures of which application can't really be checked. It can be left to the client to submit for a tariff reduction, when they can prove why this incentive can be given to them. Regarding this factor, the LGU should consider the following: - What kind of measures the Municipality wants to support? - What is the reduction impact? How is it reflected in the costs?

3.3.4.1 Sheet 1 – Attribute billing factor

Table 7 - Step 3: Attribute a level of tariff for each customer- setting the billing factor (*example*).

Under each category, the full lists of clients are listed (using the data gathered from sources mentioned above). For each of the clients, the value of the parameters must be completed, to allow the calculation of the billing factor. For the families in social aid, "yes" must be selected under the exclusion column and the factor will become "0".

Customer list	Garden	Garden factor	Size	Size factor	Distance to city center	Distance factor	Big or special producer	Production factor	Reduction measure	Incentive factor	Exclusion (social reasons)	Billing factor
	Yes/no	[-]	[inhab.], [empl.] or [m2 building]	[-]	[km]	[-]	yes/no	[-]	yes/no	[-]	Yes/no	[-]
Households												
Family xyz	yes	+ 100%	7	+ 80%	2	+ 0%	no	+ 0%	no	-0%	yes	**0.0**
Family stu	yes	+ 100%	5	+ 40%	3	+ 0%	no	+ 0%	yes	-20%	no	**2.2**
…												
Institutions												
Institution I1	yes	+ 100%	31	+ 63%	1	+ 20%	no	+ 20%	yes	-20%	no	**2.8**
Institution I2	no	+ 20%	345	+ 900%	4	+ 20%	no	+ 20%	no	-0%	no	**10.6**
…												
Businesses cat. 1, low waste production												
Business B1.1	no	+ 20%	2250	+ 900%	5	+ 20%	no	+ 20%	yes	-20%	no	**10.4**
Business B1.2	no	+ 20%	60	+ 40%	12	+ 60%	yes	+ 100%	yes	-20%	no	**3.0**
Businesses cat. 2, medium waste production												
Business B2.1	no	+ 20%	1000	+ 400%	5	+ 20%	no	+ 20%	yes	-20%	no	**5.4**
Business B2.2	no	+ 20%	30	+ 40%	12	+ 60%	yes	+ 100%	no	-0%	no	**3.2**
Businesses cat. 3, high waste production												
Business B3.1	no	+ 20%	350	+ 140%	5	+ 20%	no	+ 20%	no	-0%	no	**3.0**
Business B3.2	no	+ 20%	100	+ 80%	12	+ 60%	yes	+ 100%	no	-0%	no	**3.6**
Total												**46.4**

3.3.4.2 Sheet 2 – Calculate the tariff

Table 8 - Step 4: Sheet 2 - Attribute a level of tariff for each customer- setting the billing factor (*example*)**.**

Base data	Value	Unit	Description
Cost budget			
Cost budget including amortization (from cost model)	*80'000'000*	*Lek/y*	*Total waste management cost per year.*
Clients			
See "Tariff SC3 - data" sheet			
Nb of "units" to consider	46.4	*units*	*Collected by formula. The number comes from the total units, which are produced by the Sheet1, above.*
General non-payment rate	30	*%*	*The percentage of tariff which cannot be collected. This amount is redistributed to the other clients who pay for the tariff. The LGU might subsidize this amount, instead of redistributing it.*
Calculation of tariff			
Frequency of tariff	2	*bills/y*	
Reference tariff	1400	*Lek/bill*	*This tariff will be paid by clients for whom the billing factor is 1, if the non-payment rate is not redistributed*
Reference tariff including non payment rate	1800	*Lek/bill*	*This is the real base tariff, which incorporates the redistributed non-payment rate, aiming at full cost recovery.*

Table 9 – Step 5 – Sheet 2 - Tariff calculations (*example*)

The data here are linked with the Table 7 of Sheet 1. There is no need to add here again the lists, as they are populated by formula, collecting data from the Sheet 1. In order to calculate the tariff, the user must add as many rows under each category, as clients are listed in the Table 7 of Sheet 1. Then, select the first row of the category (which has the formulas not damaged, be careful not to lose this row) and drag down, using the excel data method for populating the cells by the same formula in progressive method. You will notice that the rows of the model are self populated. By doing so, all clients and billing factors will be populated and the tariff will be self calculated.

Clients	Factor of billing	Bill	
Households			
Family xyz	0.0	-	Lek/bill
Family stu	2.2	338	Lek/bill
…			
Institutions			
Institution I1	2.8	435	Lek/bill
Institution I2	10.6	1,631	Lek/bill
…			
Businesses cat. 1, low waste production			
Business B1.1	10.4	1,600	Lek/bill
Business B1.2	3.0	462	Lek/bill
Businesses cat. 2, medium waste production			
Business B2.1	5.4	831	Lek/bill
Business B2.2	3.2	492	Lek/bill
Businesses cat. 3, high waste production			
Business B3.1	3.0	462	Lek/bill
Business B3.2	3.6	554	Lek/bill
…	…	…	
Total billing for 1 period 6 months)	**46.4**	**7,143**	**Lek/period**
Total billing for 1 year		**14,285**	**Lek/year**
Income (if non-payment rate = estimated rate):		**800,000**	**Lek/year**