ADDRESSING KEY CHALLENGES OF SUSTAINABLE URBAN MOBILITY PLANNING

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CH4LLENGE

Addressing Key Challenges of Sustainable Urban Mobility Planning

D8.1 Updated IEE performance indicators

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1. EU Environmental Policy and CH4LLENGE

The European Union has set itself ambitious climate and energy targets which are to be reached by 2020 (i.e. 20% less greenhouse gases, 20% better energy efficiency, 20% share of renewable energy sources). The contribution from urban transport to meet these objectives is crucial. Urban and regional motorised transport is a major contributor to climate change, inefficient energy use, excessive air and noise pollution – factors that are negatively influencing the quality of life of inhabitants and the environment.

There are different strategies to mitigate negative impacts from the transport sector which are known as the 'avoid-shift-improve' approach (ASI). The ASI approach describes the three basic ways to achieve low-carbon and energy-efficient mobility by reducing (avoid) demand, shifting to or maintaining the share of environmentally friendly modes such as walking and public transport, as well as improving the efficiency of engines and the quality of fuels. Political and administrative actors are responsible for the implementation of policies and measures towards an environmentally sound, efficient and accessible transport system. Policies and measures on national or supranational (e.g. EU) levels offer considerable emission reduction potentials in setting the legal and financial framework for the development of transport infrastructure development and in mainly addressing technological improvements. On the local and regional level the availability of a high-quality public transport network and a pedestrian and bicycle-friendly infrastructure have to be ensured as well as the implemantation of policies and measures which cut private car use. Local, respectively regional, policies and measures need to address a shift to more sustainable transport modes and the reduction of traffic volume and specific energy consumption, and consequently the reduction of $CO2$ emissions per passenger-kilometre or tonne-kilometre.

Sustainable Urban Mobility Planning (SUMP) is an EU promoted comprehensive approach to enhance transport planning processes on the local and regional level towards sustainable transport systems and mobility behaviour. SUMP aims to promote more sustainable transport modes, which means cleaner vehicles and an increase in the use of public transport as well as cyling and walking but also taxi and carsharing. Shifting trips from private motorized modes to public transport has a huge GHG and energy mitigation potential. If the shift strategy is combined with dense and transit oriented development (avoid) strategies the effect can even be higher. SUMP also aims at sectoral integration with e.g. land use policies and has, therefore, the potential to influence also the organisation of a city. Dense mixed-use urban areas (residential, commercial, institutional, etc. functions) can reduce travel activities and trip lengths and also have an influence on the choice of mode.

Previous European experiences have shown that improved sustainable planning processes lead to more efficient planning and management of actions in cities. This commonly leads to positive results on modal shifts and transport-related energy savings.

The conception of SUMP is the following:

- A Sustainable Urban Mobility Plan (SUMP) is a way of tackling transport-related problems in urban areas more strategically.
- A SUMP formulates the principles by which means and what kind of process is necessary in order to achieve sustainability targets in urban mobility.

- SUMP is an innovative approach that fosters planning practice and culture aiming at a truly sustainable urban transport development. SUMP means planning for people instead of cars and contributes to better quality of life in an urban area.
- An approved SUMP makes it easier for decision-makers and planning authorities to develop environmentally sound, efficient and accessible transport systems.

The EU co-funded project CH4LLENGE addresses significant barriers for the wider take-up of SUMPs in Europe. In a joint undertaking together with research and resource institutions, the project will support European cities at different stages of advancing the take-up of SUMPs. Building on previous experiences and lessons from earlier and on-going national and European SUMP initiatives, the consortium has identified common challenges which pose significant barriers in the wider take-up of SUMPs in Europe.

2. Estimation of Impact of SUMP

Through the take up of SUMPs, CH4LLENGE aims to contribute to the implementation of the European 2020 strategy by reducing the demand for transport and increasing the share of sustainable modes of transport in European cities.

Ex-ante impact assessment of SUMP as a complex planning approach bears several uncertainties due to its inherent characteristics and the field of application. This following list is not exhaustive but rather provides examples for the limitation of ex-ante assessment of SUMP.

- SUMP is a planning instrument which has only indirect effects on transport activities and share of modes. In contrast, technological measures (improvements of engines and fuels) have direct effects and ex-ante assessment is much easier.
- Impacts of SUMP depend on the realisation and enforcement of policies and measures. The bare existence of SUMP might not lead to any reduction.
- Each city is different and will realise different measures and policy packages; consequently, effects will differ among cities as well. Therefore, it is problematic to operate with average figures.
- Experiences show that most cities do not have sufficient instruments in place for defining a proper baseline. Moreover, it has been observed that monitoring and evaluation of impacts are not always common practice in cities. Ex-ante as well as ex-post evaluation are therefore difficult.
- It is generally difficult to allocate reduction to one specific measure or policy in a complex system like the transportation system. Additionally, it is difficult to trace back the reduction to the existence of a SUMP.
- It is problematic to diffentiate between policy induced reductions versus social and economic effects. Demographic factors, for example, have a major impact on transport activity and have usually to be taken into account.
- Last but not least, transport policy is a multi-level policy field; changes induced from supranational, national and state or regional policy are difficult to allocate to a single level.

Nevertheless, best practice examples like the city of Gent, partner city in CH4LLENGE, show that SUMP can make a difference. Substantial change in the transport sector towards more sustainability and quality of life can be achieved if the principles of SUMP are considered.

The CH4LLENGE project will remove barriers allowing cities to start developing SUMPs. One of the key challenges, which will be addressed by the project, is evaluating and monitoring progress in SUMP. Local authorities frequently underestimate the need for monitoring and evaluation in SUMP. CH4LLENGE will provide guidance on monitoring and evaluating for both: measures and the entire SUMP development process. Lessons drawn will be summarised in an 'evaluation and monitoring kit' helping other European cities to plan for their own evaluation and monitoring processes in the framework of their own SUMP.

In the following chapters the qualitative and quantitative estimations regarding the expected outcomes by 2020 made in Annex I (DoA) are presented and will be afterwards critically reviewed. The update of Common Performance Indicators (CPIs) will be made according to the confirmation or adjustement of the expected outputs and, if available, current data is considered.

3. Specific Objectives and Impacts of CH4LLENGE in Annex I, DoA

As already mentioned above it is ambitious to deduct environmental and energy related 'hard fact' performance indicators from a process-oriented initiative. SUMPs will result in the implementation of measures (packages) which then result in concrete and actual energy savings.

The first assumptions about objectives and impacts if CH4LLENGE will be realised have been presented in Annex I (DOA). It was stated that CH4LLENGE addresses the priorities of the IEE 2012 work programme and will contribute to reducing the demand for travel by car and to shift travel and transport to more efficient transport modes (STEER key action energy efficient transport) – in particular through the wide and targeted take-up of Sustainable Urban Mobility Plans.

The key concept of CH4LLENGE is to analyse specific barriers of SUMP on the local and regional level in greater detail and to conceptualise solutions how to overcome those barriers on the basis of the cities' pilot schemes in and the dialogue process (survey, experience exchange; particularly with Follower Cities).

CH4LLENGE's overall objectives have been slightly redefined:

CH4LLENGE will

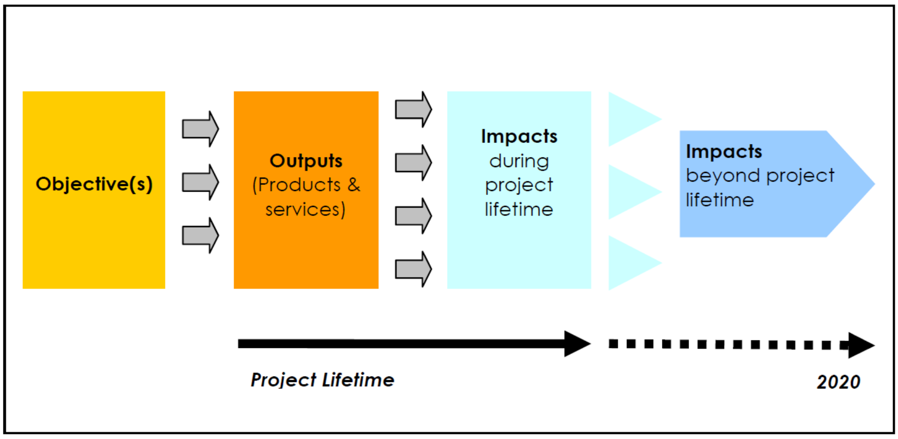
1. develop transferable solutions to overcoming challenges related to participation of stakeholders in the process of SUMP development and implementation
2. provide transferable strategies to overcoming challenges related to institutional cooperation in the process of SUMP development and implementation
3. elaborate a tool to identify effective measures and measure packages
4. present transferable solutions to overcoming challenges related to monitoring and evaluation in the process of SUMP development and implementation
5. actively facilitate the take-up of SUMPs in European cities
6. upscale the outputs for European exchange, transfer and mutual learning on overcoming SUMP challenges and establish a cross-initiative SUMP dialogue

These overall objectives already developed in the proposal are still and will remain the key objectives for the project until its end in 2016.

Furthermore it was demonstrated which long-term effects CH4LLENGE might have in order to contribute to the EU's mobility and climate targets. The strategic objective of CH4LLENGE by 2020 is that the project has made a significant contribution to the planning culture in its partner cities and will have contributed to meeting the EU's mobility and climate targets. Due to the project all associated cities made progress in the application of SUMP, which would have lead to a change of urban transport structures.

Guidelines for the calculation of the IEE CPIs from March 2013 describe the result chain how estimation of CPIs should be provided. The CH4LLENGE DoA already follows these rules to define objectives and outputs which lead to outcomes resp. impacts during and beyond project lifetime.

Figure 1: Result Chain



After the specification of outputs and outcomes for the the duration of the action as well as long-term outcomes beyond the duration of the action until 2020, IEE Common Performance Indicators have been estimated (see table 1).

Table 1: IEE Common performance indicators as in Annex I DoA

Specific and strategic objective	Target within the action duration:	Target by 2020:
Contribution to the EU 2020 targets on energy efficiency and renewable energy sources	▪ 4 Million Euros cumulative investment made by European stakeholders for starting SUMPs in 5 participating advancing cities	▪ 22 million Euros cumulative investment made by European stakeholders for developing SUMPs in 40 cities (optimisers, advanced and followers)
	▪ *0 Renewable Energy production triggered (toe/year)*	▪ *0 Renewable Energy production triggered (toe/year)*
	▪ 64,000 toe/year Primary energy savings compared to projections in 5 SUMP cities (through implementation of measures outside the scope of the project)	▪ 592,000 toe/year primary energy savings compared to projections in optimisers, advanced and follower cities
	▪ 160,000 t CO_2e/year reduction of greenhouse gas emissions in 5 advancing SUMP cities (through implementation of measures outside the scope of the project)	▪ 1,480,000 t CO_2e/year reduction of greenhouse gas emissions

The estimation of CO2 reduction and energy savings is based on results of previous projects and surveys. For the ex-ante impact assessment the assumption is that the implementation of different transport measures are triggered by a more strategic transport planning in the five advancing partner cities.

For the calculation of investment an example from France was considered where the development of a PDU costs about 1 Euro per city inhabitant. This figure includes the cost for the planning process itself but not the implementation of measures resulting from such plans.

4. Review of Expected Outcomes

Since end of March CH4LLENGE started its work with city partners and follower cities. Currently, the main task is to analyse the current status of SUMP as well as experiences and strategies to deal with challenges in SUMP.

At the first SUMP challenge workshop participating cities have been asked for a self-assessment of their SUMP status and the identification of strength and weaknesses of their SUMP processes. The SUMP self-assessment gives a good overview about cities having an SUMP in place or currently preparing a SUMP. A number of cities do not have a SUMP but several thematical plans and other cities do not have any urban mobility plans in place (see following table 2).

Table 2: SUMP self-assessment of CH4LLENGE participating cities

City	Country	Role	Inhabitan	Approved SUMP in pla	SUMP under preparation	Topical plans in place (road - cycling - parking ...)	No specific plans in place
Brno	Czech Republic	Advancing Cities	378.327		x	x	
Budapest	Hungary	Advancing Cities	1.733.685		x	x	
Krakow	Poland	Advancing Cities	759.131		x	x	
Timisoara	Romania	Advancing Cities	311.428			x	
Zagreb	Croatia	Advancing Cities	790.017			x	
Antalya	Turkey	Follower City	1.001.318			x	
Bielefeld	Germany	Follower City	327.199	tbd	tbd	tbd	tbd
Chiaravalle	Italy	Follower City	15.056	tbd	tbd	tbd	tbd
Coimbra	Portugal	Follower City	143.052				x
Gdynia	Poland	Follower City	248.574		x	x	
Gostyn	Poland	Follower City	20.183				x
Kalmar	Sweden	Follower City	36.392		x		
Kaunas	Lithuania	Follower City	353.800			x	
Koprivnica	Croatia	Follower City	31.554	tbd	tbd	tbd	tbd
Kotka	Finland	Follower City	54.877			x	x
Ljutomer	Slovenia	Follower City	11.720	x			
Lviv	Ukraine	Follower City	734.000	tbd	tbd	tbd	tbd
Madrid	Spain	Follower City	3.198.645		x	x	
Nova Gorica	Slovenia	Follower City	36.710	x			
Pardubice	Czech Republic	Follower City	89.467	tbd	tbd	tbd	tbd
Riga	Latvia	Follower City	699.203			x	
Seville	Spain	Follower City	698.042	tbd	tbd	tbd	tbd
Skopje	Macedonia	Follower City	506.926	x			
Targu Mures	Romania	Follower City	127.849			x	
Tartu	Estonia	Follower City	103.284			x	
Turku	Finland	Follower City	180.314			x	
Utrecht	Netherlands	Follower City	321.989	x			
Venice	Italy	Follower City	270.589	tbd	tbd	tbd	
Vienna	Austria	Follower City	1.757.353	x	x	x	
Warsaw	Poland	Follower City	1.711.324	x		x	
Wermelskirchen	Germany	Follower City	34.781	tbd	tbd	tbd	tbd
Amiens	France	Optimising Cities	133.448	x	x		
Dresden	Germany	Optimising Cities	525.105		x	x	
Gent	Belgium	Optimising Cities	248.242	x	x		
West Yorkshire	UK	Optimising Cities	2.226.058	x		x	
Total		**19.819.642,00**					
Follower Cities		**12.714.201,00**					
Optimising Cities		**3.132.853,00**					
Advancing Cities		**3.972.588,00**					

As shown in the table, the cities are at very different stages of SUMP. This might have effects on the prognosis for a successful take-up of SUMP practice within a certain time frame and consequently at which point CO_2 and energy reduction in urban transport can be realised.

The following table shows the estimation of expected outcomes by 2020 and a critical review (see right column).

Table 3: Review of expected outcomes by 2020

Strategic Objective(s)	Expected outcomes by 2020	Review
Advancing cities will have implemented measure packages of their first SUMP, and they will be working on fine-tuning and optimising. They will have become forerunners of SUMP in Europe.	• After successful implementation of different SUMP measures, the cycling and walking share in the advancing cities increases steadily by 1 % a year; at the same time individual motorized traffic use decreases (first modal shift towards soft modes achieved). • Each advancing city will have public bicycle systems in place following examples from countries where such systems are in place (e.g. Velib, Bicing). • Environmental and slow-tempo zones (30 km max.) established in all inner-city districts of advancing cities reducing the noise and air pollution • A broader acceptance and deployment of clean vehicles, in particular electric, among public transport operators will lead to better air quality, less noise pollution and more comfort for passengers and citizens (CO_2 emissions dropped) • Advancing cities are national role models for SUMP in their countries exchanging on good practices with other cities in their countries • Lessons learnt will support establishment of national SUMP legislation in NMS	• These numbers are quite optimistic due to the fact that SUMP processes have just started in most of the cities. Implementation of measures might therefore take longer than estimated. • New estimation: some, but not all of the advancing cities will have public bicycle systems; in addition, unclear effect on reduction. • Not only SUMP but mainly EU legislation will enfource cities to become active • Difficult to differentiate to which extent reductions are SUMP related. • Development of technological progress indepent from SUMP but SUMP can facilitate the application of energy efficient technologies. • OK • Uncertain, and not clear to what extent CH4LLENGE will contribute to the political progress
All CH4LLENGE cities will have implemented effective SUMP measures	• Soft mode mobility will be further increased and freight problems minimised • New participation tools will be in place reaching “high-hanging fruits”, e.g. those hard to reach • Cities will work on next generation SUMPs	• Confirmed for passenger transport; progresses in city logistics are difficult to achieve • OK • OK
30 follower cities will be finalising their first full SUMP	• 30 new SUMPs in place in Europe ready to implement measures that meet EU’s mobility and climate objectives • Further increase of number of SUMP take-up cities in the 19 countries of follower cities (follower cities became national role models)	• New estimation: There will be progress, more and better strategic mobility planning but not all of the cities will have a full SUMP • New estimation: not valid for all participating European countries
Other European cities having benefitted from	• New SUMPs under preparation and first in place ready to	• OK

CH4LLENGE's kits and outreach activities	contribute to better mobility and living situation in European cities • CO_2 emissions dropped in these cities	• CH4LLENGE kits will be published and disseminated in 2016. Timeframe 2016 to 2020 might be too short to see relevant changes and reduction.
Contributing to EU policies	• SUMP take-up cities contributed to reaching goals of the Transport White Paper, 2010 Energy Strategy, the energy action plan and policies yet to come	• OK

5. Update of Common Performance Indicators

Proven benefits of SUMP respectively strategic urban transport planning processes

National research institutes, for example in France and in the UK, have developed tools and concepts to assess the benefits of SUMP. In France, the assessment of the Urban Mobility Plans (PDUs) through CERTU contributed to the advancement of PDUs into second and third generation plans. A comparable process was undertaken in the UK for assessing the impacts of Local Transport Plans. A modal split change towards sustainable transport modes of 1% per year could be achieved optimistically based on LPT 2nd generation achievements and LPT 3rd generation projections in the UK.

For example, in a survey in 22 cities which implemented SUMPs, 85% reported an improved access to public transport services. Reductions in the proportion of journeys made by car were reported by 70% of cities, and increases in bicycle use by 85% of cities. Increases in walking as a travel mode were observed in 55% of responding cities. But only 15% of respondents reported an increase in the proportion of vehicles running on alternative fuels.

Also single cases like the city of Freiburg, Germany or Copenhagen, Denmark prove that a long lasting and target oriented urban mobility strategy leads to a more sustainable transport system and better quality of life. Copenhagen was awarded to be the European Green Capital in 2014 and Freiburg was nomitated as the most sustainable German city in 2012.

Positiv effects of shift and avoid strategies in urban transport

There are several studies on the basis of concrete measures or scenarios which prove the mitigation effects of shift and avoid strategies in urban transport. E.g. research of the Institute for Transport Studies showed that optimal strategies typically reduce car use by around 15% to 20%, and that typical benefits were in the range of 5,000-7,000 Euros per inhabitant when appraised over a 30 year period. Santos et al. (2010)[1] give extensive examples how policies can effect sustainable road transport. Wright and Fulton (2005)[2] analysed the GHG mitigation potential of an imaginary city and found out that CO2 emission could bee reduced by 4 per cent if a bus rapit transit system reaches a share of 5 per cent and car use dropped. The authors assumed an increase in bicycle mode share from 1 to 5 per cent, whereby the share of cars, public transport and walking is slightly reduced when 300 kilometres cycle lanes were built. This result in GHG emissiom reduction of approximately 3.9 per cent compared to the reference case without cycling infrastructure.

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[1] Santos, G.; Behrendt, H. and Teytelboym, A. (2010) Part II: Policy instruments for sustainable road transport. Research in Transportation Economics, 28(1):pp 46-91

[2] Wright, L. and Fulton, L. (2005): Climate Change mitigation and transport in developing nations. Transport Review. Vol 25, no 6, pp 691-717

Estimation of mitigation effects in CH4LLENGE cities

Due to the different development stages in SUMP CH4LLENGE cities different mitigation targets in passenger transport and city logistics can be achieved. Basis for the potential are the assessment how many kilometres can be either shifted to non-motorised transport or public transport or avoided as a result of a transit oriented development per person and year. Mitigation potential is calculated for the respective city group (optimising, advancing and follower cities) within duration of the project and for 2020. Spatial planning has long-term effects and first smaller effects may occur in 2020.

Following assumptions relevant for the calculation have been made:

Indicator	Value	Unit	Source
Distance travelled by car per person in urban areas	8.800	car-pkm / year	http://www.plan4sustainabletravel.org/downloads/cfit_background_report.pdf
Share of urban & regional journeys	80%		
➔ **Car related carbon emission for urban & regional journeys**	**7.040**	**car-pkm / year**	
Share of population aged 18+ years	80%		Eurostat
Carbon emissions of private car (2011)	0,180	kgCO2 / km	
Carbon emissions of private car (2011)	**0,120**	**kgCO2 / pkm**	**http://www.eea.europa.eu/data-and-maps/figures/specific-co2-emissions-from-road-1**
Carbon emissions of private car (2020)	**0,096**	**kgCO2 / pkm**	20% lower than 2011
Carbon emissions of public transport (2011)	**0,037**	**kgCO2 / pkm**	http://www.eea.europa.eu/data-and-maps/figures/specific-co2-emissions-from-road-1
Carbon emissions of public transport (2020)	**0,030**	**kgCO2 / pkm**	20% lower than 2011
Conversion rate 1 liter fuel to kWh	9,6	kWh/litre	
Conversion rate 1 kWh to toe	8,5984 5E-05		
Average emission factor for fuel (50-50 split between gasoline and diesel)	**2,48**	**kg CO2/litre**	Split based on http://www.covenantofmayors.eu
Average occupancy rate - passenger car	**1,5**	**p/car**	http://www.eea.europa.eu/data-and-maps/figures/term29-occupancy-rates-in-passenger-transport-1
Specific CO2 emissions - passenger car (2011)	**7,3**	**l/100km**	http://eea.europe.eu

Note: The values in bold are directely relevant for the calculation

Table 4: Estimation of mitigation potential for CH4LLENGE

		Mitigation potential per person per year								Cumulative mitigation potential	
City type		**km shifted from car to urban and regional public transport**	**kgCO2 savings**	**km shifted from car to non-motorised modes**	**kgCO2e savings**	**kgCO2 savings**	**car km avoided**	**kgCO2 savings**	**Tota kgCO2 savings**	**tCO2 savings per city group and people >18 and year**	**Total tCO2e savings per year**
Optimising cities (Amiens, Gent, Dresden, West Yorkshire)		Within action duration:		Within action duration:			Within action duration:			Within action duration:	**315.841**
	%	5,0		5,0			-				
	km	352	29	352	42	72	0	0	**72**	179.371	
		Target by 2020:		Target by 2020:			Target by 2020:			Target by 2020:	**1.590.016**
	%	10,0		10,0			3,0				
	km	704	47	704	68	115	211	32	**146**	366.393	
Advancing cities (Brno, Budapest, Krakow, Timisoara and Zagreb)		Within action duration:		Within action duration:			Within action duration:				
	%	3,0		3,0			-				
	km	211	18	211	25	43	0	0	**43**	136.470	
		Target by 2020:		Target by 2020:			Target by 2020:				
	%	6,0		6,0			3,0				
	km	422	28	422	41	69	211	32	**100**	319.033	
Follower cities		Within action duration:		Within action duration:			Within action duration:				
	%	-		-			-				
	km	0	0	0	0	0	0	0	**0**	0	
		Target by 2020:		Target by 2020:			Target by 2020:				
	%	5,0		5,0			3,0				
	km	352	23	352	34	57	211	32	**89**	904.589	

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For the calculation of investments the example from France is considered where the development of a PDU costs about 1 Euro per inhabitant of a city. This includes costs for the planning process itself but not the implementation of measures resulting from such plans. Actually, the investment costs of SUMP are much higher because the SUMP serves as a basis for the legitimation and implementation of measures like infrastructure development and accompanying soft measures. This would exceed the investement costs considered by far. The actual costs of implementation are difficult to calculate on average. The city of Berlin, for example, has estimated 1 billion Euros as costs for the realisation of measures of their mobility masterplan.

It is assumed that half of all CH4LLENGE cities will either have started, prepared or finalized their SUMP until the project's end.

Table 5: Updated IEE Common performance indicators for CH4LLENGE

Specific and strategic objective	Target within the action duration:	Target by 2020:
Contribution to the EU 2020 targets on energy efficiency and renewable energy sources	▪ ≈7.1 Million Euros cumulative investment made by European stakeholders for starting SUMP in half of CH4LLENGE participating cities (ca. 10 million inhabitants)	▪ ≈19.8 million Euros cumulative investment made by European stakeholders for developing SUMPs in CH4LLENGE participating cities (optimisers, advanced and followers)
	▪ *0 Renewable Energy production triggered (toe/year)*	▪ *0 Renewable Energy production triggered (toe/year)*
	▪ 1,053 toe/year primary energy savings as projections for CH4LLENGE participating cities	▪ 5,299 toe/year primary energy savings projections for CH4LLENGE participating cities
	▪ 3,158 t CO_2e/year reduction of greenhouse gas emissions as projections for CH4LLENGE participating cities	▪ 15,900 t CO_2e/year reduction of greenhouse gas emissions projections for CH4LLENGE participating cities