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Executive Summary

Nowadays the demand for energy is increased by growth of economic and population. Information and Communication Technology (ICT) solutions have been identified to play a vital role in reducing the energy intensity, increasing the energy efficiency of the European Union (EU) economy and mitigating the climate change globally. ICT and ICT-based innovations may provide one of the most potentially effective means for Member States to achieve the 2030 target and are the key to deliver the fundamental, yet urgent changes required in local and regional communities. Despite this, the rapid development and diffusion of ICT will not only improve energy efficiency and thereby help combat climate change, it will also stimulate the development of a large cutting-edge market for ICT enabled energy-efficiency technologies and services that will foster the competitiveness of European industry and create new business opportunities. The goal of the SIT4Energy project is to demonstrate how integrated energy management for prosumer scenarios can be realized through a smart IT solution that considers both efficiency potentials in the local energy production and consumption. The solution provided may be helpful in achieving more energy savings combining the operation of the different systems in the building both for energy prosumers and consumers, by providing feedback to change user's behaviour and help to increase users' comfort.

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List of Acronyms and Abbreviations

Term	Description

DSO: Distribution system operator

EE: Energy efficiency

ESCO: Energy services company

ICT:Information and communication technologies

NGO: Non-govermental organization

R&D: Research and development

RE: Recommendation engine

SME: Small and medium-sized enterprise

1. Introduction

This document is the first version of the SIT4Energy impact assessment entailing the Dissemination, Communication and Exploitation Strategy of the SIT4Energy project. The document sets out the general overview of SIT4Energy impact on economics, social and environment. It assesses the direct and indirect linkages between the ICT enabled energy-efficiency technologies (as part of the SIT4Energy ecosystem to be delivered) and labour markets, social welfare, environment at both the micro and the macro levels. It includes a literature review on energy efficiency that can have a range of benefits to households, businesses and wider society. In addition, the study highlights the basic means and metrics to be used in the lifetime of the project for the achievements of SIT4Energy main goal, objectives and expected impact.

In detail, the deliverable outlines the measures for achieving the project expected impact as initially defined in the description of the work through dissemination, communication and exploitation, guiding all the outreach activities of the project and beyond. These proof points will also serve as catalysts for stimulating and preparing concrete exploitation actions of the SIT4Energy participants and targeted industrial partners act as multipliers for post-project pilot organizations, thereby ensuring the replication and sustainability of SIT4Energy outcomes extending the project impact throughout the EU.

Given the early stage in the project development, the novelty of the SIT4Energy platform and its individual elements under development, the presented SIT4Energy impact assessment in this version of the document is preliminary and will be expanded and revised as more specific achievements will be reached during the lifetime the project.

1.1 Structure of the deliverable

This deliverable is structured as follows:
Section 1: Gives a brief introduction to the purpose of the deliverable and its contribution
Section 2: Describes the SIT4Energy expected social, environmental and economic impact
Section 3: Presents the initial SIT4Energy impact assessment means and metrics
Section 4: Presents the conclusion of the document

1.2 Relation to Other Tasks and Deliverables

This deliverable is strongly connected to other tasks in WP5, in particular to T5.1 “Project scientific and technical coordination and management”, T5.2 “Dissemination and Communication” and T5.3 “Exploitation activities”. Furthermore, the outcomes of all other work packages in which the SIT4Energy system and its individual components are defined, developed and validated.

2. SIT4Energy Expected Impact

2.1 Introduction

Energy efficiency improvements can yield substantial multiple benefits across a wide range of sectors having the potential to bring about long-term social, economic and environmental benefits globally. Energy efficiently can produce energy savings at all levels (individual, sectoral, national or international) and the impacts of those energy savings can trickle through to generate wider socioeconomic outcomes (e.g. businesses can become more competitive and households face lower fuel bills). At macroeconomic level, lower fuel imports mean an improvement to the balance of trade, reduced exposure to price shocks and greater energy security [1, 2 3].

Reducing energy consumption remains a goal of energy ministries and only well targeted policies are the best way to achieve energy conservation. Increasing efforts and research studies are ongoing aiming at the reduction the impacts of energy consumption and carbon emissions to protect the environment. One of the ways to improve energy efficiency is to tap the huge potential for efficiency gains in the building sector. Buildings are critical components of urban systems, both as physical structures and as providers of social and economic services. Absorbing around 40% of final energy, currently almost 75% of buildings is energy inefficient in Europe and, depending on the Member State, only 0.4-1.2% of the stock is renovated each year. Thus, improving building energy efficiency is one of the fastest and most cost-effective ways to achieve economic, environmental, and social benefits for city inhabitants.

The key elements of energy efficiency on building performance are smart meters and demand response. All of these can be enabled or enhanced by ICT due to the ability to monitor energy consumption and automate processes [4,5]. In this respect, the SIT4Energy main approach is to assist consumers and prosumers as occupants of various buildings (residential and working spaces) to better control their energy demand and to reduce the environmental footprint by proposing intelligent mobile recommendation service and Smart Energy Management Dashboard that exploit smart analytics to analyse consumption data, behavioural patterns. Aiming at approaching to the utilization of advanced energy management services and well-designed feedback initiatives SIT4Energy offers the opportunity to transform traditional energy structures in ways that benefit households, utilities, society, economy, and the environment.

2.2 Social impact

The positive impact of energy efficiency in the residential sector is a particularly strong case for public health and associated social impacts. A broad range of illnesses, particularly respiratory illness and asthma among children, have been strongly associated to cold indoor temperatures and damp and mould in housing. Improved energy efficiency in the buildings sector, in particular, can bring a wide array of appreciable benefits for the health of residential occupants, office workers, and many other groups, as well as the population as a whole. Health impacts have equally been linked to inefficient housing and appliances in the developing world. The Global Alliance for Clean Cookstoves estimates that reducing black carbon by replacing traditional cookstoves with energy efficient ones will reduce the incidence of child pneumonia by 50%. By intervening at the household level, energy efficiency can reduce energy bills through insulation and design, delivering efficient appliances, space and water heating equipment and lighting, while providing training in efficient energy-use-behaviour among occupants. Such programmes increase occupant comfort and health, well-being and livelihood [1]

2.3 Environmental impact

The design and adoption of advanced information and communication technologies (ICT) towards achieving higher levels of energy efficiency in the buildings sector is considered promising, as stated in the Global e-Sustainability Initiative SMARTer2030 report [6]. In particular it has reported that ICT can enable 20% reduction of global CO_{2e} emissions by 2030, holding emissions at 2015 levels. In

addition to reducing carbon emissions ICT offers also significant environmental benefits. The most substantial benefits identified by the same study includes the increase of agricultural crop yields by 30%, saving over 300 trillion litres of water and saving 25 billion barrels of oil per year. It was found that by rolling out identified ICT solutions across the global economy, total global emissions of CO2e could be cut by 12Gt by 2030, promoting a path to sustainable growth. In overall the CO2e abatement potential based on different use cases is illustrated in Figure 1. As shown in the figure by 2030 the ICT has significant impact on environment and CO_{2e} abatement potential through Smart Buildings and Smart Energy technology.

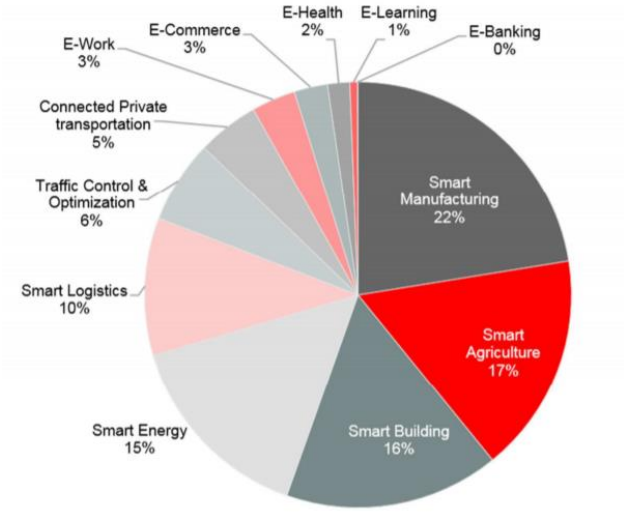

Figure 1. Environment - CO_{2e} abatement potential by use case (2030) [6]

Furthermore, as presented in
Figure **2** the application of ICT-enabled solutions is going to provide residents/building workers with greater insight and control, and an enhanced living /working experience whilst saving energy and resources both in existing buildings as well as newly constructed buildings. One of the ICT roles is being an instrument in achieving improved process efficiency through simulation, modelling, analysis; monitoring and visualisation tools that are needed to facilitate a "whole building approach" to both design and operate buildings.

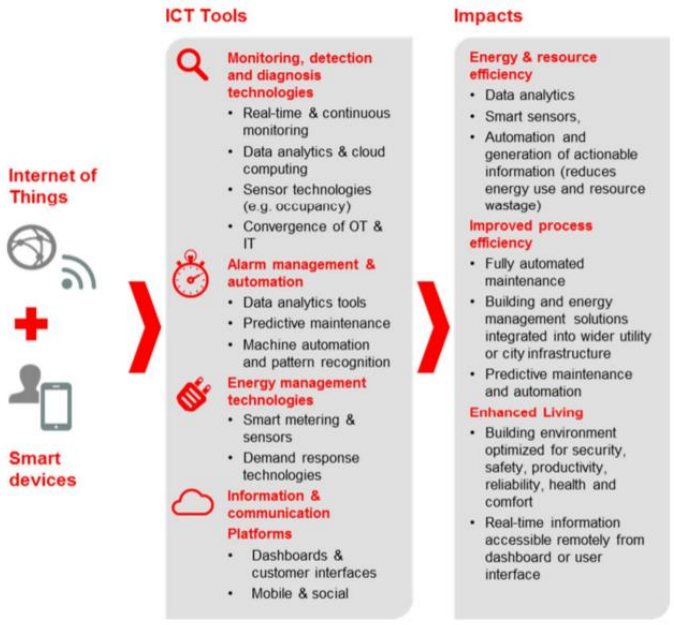

Figure 2. Smart buildings' technology vision [6]

The application of novel ICT technologies for energy efficiency has also to rely on people adjusting their energy consumption behaviour. Consumers can be provided with as many energy efficient products as there are on the market, yet the big issue is the awareness around energy savings. They must also be educated on how to reduce energy not by purchasing new products, but by changing their behaviours and habits when using these appliances. This is the biggest challenge faced by the government as the energy policies and energy consumption issues on a national plan may seemed too complex for consumers [7,8]. As mentioned in [4] feedback programs are an important additional element in changing the consumers' behaviour and that the smart metering itself cannot achieve it. Feedback tools can provide necessary and comprehensive information on how, when and how much energy is being consumed in the household and allow consumer to be active in reducing energy consumption. As stated in the report of European Environment Agency, up to 20% of energy savings can be achieved through different measures targeting consumer behaviour. In this respect SIT4Energy aims to identify the main energy consuming factors, trends, and patterns, along with the appropriate modelling and understanding of the end-users' behaviour. The offered energy management services, including feedback tools and incentives, will lead to occupants' behavioural change towards more efficient energy actions that can have an actual positive impact on both society and environment.
The outcomes of SIT4Energy will support the decision-making process by providing significant information of the sustainability and the affordability of the Ecosystem proposed, that will be the basis to replicate SIT4Energy's outcomes in a wide number of buildings in various climatic conditions, which will accelerate the consecution of such environmental impacts. Furthermore, will impact substantially on the CO_2 emission savings by shaping human behaviour while ensuring comfort in the living and working environment in low-energy and low-emission buildings.
The SIT4Energy approach will have a strong social and educational impact beyond direct savings on the pilot sites by directly and indirectly engaging end-users with different profiles including residents, students, academic staff, facility managers to be actively using the SIT4Energy Ecosystem. Furthermore SIT4Energy will educate and contribute towards more skilled and energy-literate users and facility managers by developing significant know-how in the energy efficiency technological area.

2.4 Economic impact

Deploying energy efficiency systems can save money. Energy efficiency can contribute to the central aims of energy policy (improved competitiveness, security of energy supply, and environmental protection), and can also have positive impacts on the labour market. From many literature sources [1,2] it has also found that the manufacture and installation of energy efficient equipment and materials is a relatively labour-intensive activity that has the potential to boost local labour markets. Besides there is a major digital transformation taking place in the global economy, opening up huge opportunities for business growth. ICT-solutions can help businesses around the world to continue to grow without putting our environment at risk.
Creating a market for innovative energy services will have an important, incorporating investments in efficient appliances and hardware. In this context SIT4Energy contributes to the creation of knowledge intensive services and will deliver its services as "sales of new to market". Developed products will be cost-effective with user friendly interfaces. SIT4Energy will be beneficial to DSOs and ESCOs to identify end-users' needs and motivations and will interpret energy consumption data associated with human dimension. This information could be further integrated in respective companies' price tariffs and that they become more competitive and increase their share in the energy market. Moreover, we envision SIT4Energy' s innovative ideas such as negotiation and loyalty approaches by boosting new ideas that will increase the number of SMEs that introduce new services to the EE sector, creating new jobs in the area.

3. SIT4Energy Impact Assessment Means & Metrics

3.1 Methodology

This section outlines the methodology geared towards performing a qualitative (in terms of strategy) and quantitative (in terms of concrete means & metrics) assessment of the development and execution of the activities related to the impact assessment for the SIT4Energy project. The methodology and the evaluation instruments suggested in this deliverable will be used or are already in use and the proof of concept will be applied to the production of the final impact evaluation report (M36).
In the following figure, it is illustrated the overall lifetime of SIT4Energy showing five straightforward steps towards the achievement of the expected impact.

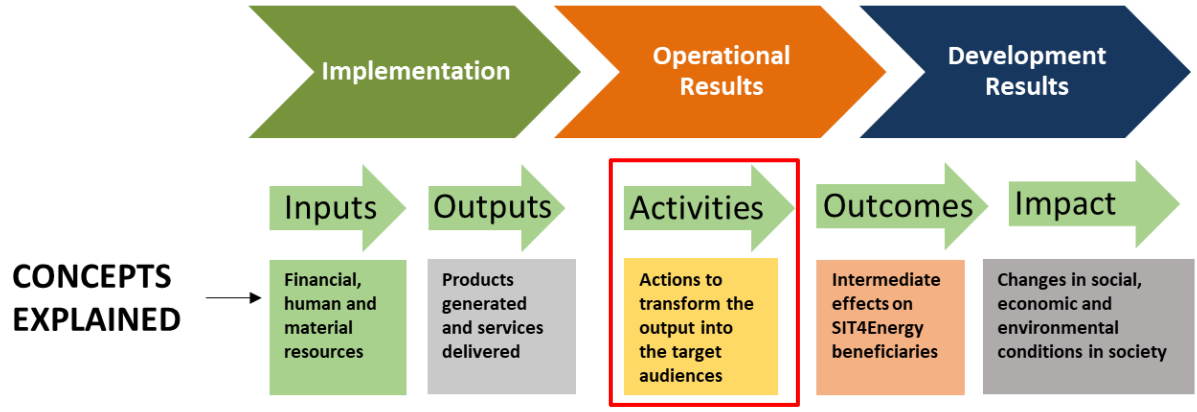

Figure 3. SIT4Energy overall lifetime

The main purpose of this deliverable is to define the main activities/actions for the transformation of the achieved SIT4Energy output towards the SIT4Energy target audiences, outcomes and eventually project impact. The following subsections present the SIT4Energy target audiences as well as a set of a coordinated actions (means and metrics) that will be undertaking throughout of the SIT4Energy lifetime necessary for the achievement of the expected SIT4Energy impact.

3.2 SIT4Energy Target Audience

The communication strategy is expected to target all directly involved and interested parties. The SIT4Energy target group includes Utilities, DSOs, SMEs, Prosumers, Consumers, Producers, Municipalities, Scientific and Technical Audience, future R&D projects etc. It is also expected to identify potential interested members who could add value on the project developments and indirectly results, exchange good practices and spread the word of the project increasing audience participation in the SIT4Energy activities and developments and as an effect the big data community.

3.3 Dissemination & communication related activities

Dissemination and stakeholder engagement are central to the success of SIT4Energy project. This section provides a description of the dissemination strategy. The dissemination activities are an essential and pervasive activity throughout the project's life, and integrated within all its work packages. In some cases, it will be helpful to experts of the domain to support our goal, making it easier to attract additional stakeholders. In other cases, good contacts with associations of active citizens and local groups can help convince authorities about the importance of our message. The challenge is to improve the accessibility of new findings to those who are trying to reach them. This means, firstly, ensuring the availability of materials or ideas to the target audiences and secondly, making these findings comprehensible to those who receive them. In addition one of the expectations is to build ownership about the project, hereby, concentrating in the good practice exchange, political leadership and dissemination of SIT4Energy results and further promotion of the domain as a whole. The key strategic mission of the communication activities is reflected on engaging as many people as

possible within the project practices, as well as makes well known the project results to a large number of communities. A good communication plan defines how the strategy will be expressed through practical public relations activities. It brings together in one document all the fundamental ideas that should be driving communications, including objectives, audiences, messages, and an overview of how the goals will be achieved. Most communication campaigns aim to change individual attitudes and behaviours or to mobilise public and decision-maker support for policy change - or a combination of both. A visual representation of the pathway between communication activities, the intended outputs, outcomes and ultimate impact is important in pinpointing the evaluation.

3.4 Exploitation related activities

Although dissemination and exploitation are closely related, they are distinct processes. While the mechanisms for dissemination and exploitation (mainstreaming and multiplication of results) often overlap, dissemination (including also information provision and awareness raising) can take place from the beginning of a project and intensify as results are becoming available, but full exploitation can happen only when it becomes possible to transfer what has been learnt into new policies and improved practices. Exploitation is a process that reaches beyond the life of the project so that its results are sustained. The process of disseminating and exploiting the results of projects with a view to optimise their value, strengthen their impact, transfer them, integrate them in a sustainable way and use them actively in systems and practices at local, regional, national and European levels increase the global impact of the project.
In the following subsections, SIT4Energy Exploitable Assets and the initial exploitation roadmap to be implementing during the project lifetime to face commercial and non-commercial strategies for those SIT4Energy Exploitable Assets is described.

3.4.1 SIT4Energy Exploitable Assets and their exploitation potential

The main results and elements of the SIT4Energy platform with high exploitation potential have been identified and described as SIT4Energy Assets. These assets are individual elements of the SIT4Energy platform (or combinations thereof) with a specific exploitation potential; including software applications and components, as well as vertical applications and the platform as a whole. The table below gives an overview of the initial list of SIT4Energy assets while the details of each asset can be found in D5.5 “SIT4Energy Exploitation strategy and plan”.

Table 1. SIT4Energy assets

Asset name	Short characterization	Main partner
User Activity Tracking Engine	Rule-based engine for user activity tracking and characterization. It will deliver services inferring the class of users’ actions in different micro-moments.	CERTH
Micro-Moments Detection Tool	Real time analysis and classification of end-user behaviour to accurately detect the optimal timeframe to engage end-users	CERTH
Recommendation Engine (RE)	Algorithms using Machine learning and rule-based systems and recommending energy efficiency actions from aggregated consumption/production data, and user context data	IMTL
Mobile App with Enhanced Visualisation schemes	The Mobile App comprising of a visualization module, analytics procedure and an activity tracking module for micro-moments detection.	ITML
Context-aware attention triggering service	Service that will consider the input regarding the activity tracking capabilities and micro-moments and include respective user type models as well as input from the mobile recommendations use context required for completing the context model, based on a developed user-centered model.	SHF
Smart Energy Management	User-centered tool with smart visual analytics for analysing	HOST

Asset name	Short characterization	Main partner
Dashboard	energy production and consumption patterns together with behavioural analytics of utility customers.	

The developed solutions will be deployed and validated in real-world pilots with the utility partner and the pilot sites in Greece and Germany. This will also serve as the preparation for the uptake of the solutions by the German utility (SHF) who will provide it as a service to their customers. Furthermore, the pilots will serve as marketing showcase for the commercial exploitation by the ITML. CERTH and HOST will exploit the results through scientific publications, development of new projects and transfer in teaching and consulting for the regional SMEs.
The joint exploitation plan of SIT4Energy consortium is based on two scenarios. Within the first model SIT4Energy partners will jointly commercialize the project's joint results by providing the SIT4Energy platform along with the services (energy saving recommendations, analytics dashboard etc.) to utilities along with third-party developers and social associations for non-profit purposes, where the aim is to maximize the energy efficiency impact. The partners will also use the generated knowledge on stimulating behaviour change to intensify their existing co-operations with energy actors and NGOs that actively participate in energy and environmental policy-making processes in Germany.
In the second model the SIT4Energy services will be exploited individually or bi-laterally by owning partners by providing them to relevant customers (e.g. a utility, ESCO or consumer organization). Details of the SIT4Energy business model describing the main product/service offerings, their target groups and routes to market will be developed and described in Workpackage 2 as defined in the work plan.
The exploitation strategies per each pilot, the related activities have been already identified in D5.5 "SIT4Energy Exploitation strategy and plan" however will be updated and improved regularly in order to test and validate its commercial market-oriented approach or even its success distribution within academical channels.

3.4.2 Milestones for exploitation

To measure the progress of exploitation activities, the project partners agreed to set several milestones. The indicators are spread to two phases of the project. The phase one lasts until M18, phase 2 begins from there and ends in M36 of the project. This decision was made because of the main work of the design and analysis of the technology pillar will be done due to M18 and the pilot setup to be started in the same month. Therefore, the second exploitation phase is predestinated to start in line with the pilot studies. The list of agreed milestones and the phase to be reached in can be seen in Table 2.

Table 2. SIT4Energy exploitation milestones

Milestones for Exploitation	Phase 1	Phase 2	Phase 3
	M1-M18	**M18-M36**	**M37- (post project)**
SIT4Energy website set-up	X		
Social network profiles/communication	X		
Organize events (seminars, workshops, etc.) to disseminate technologies as derived from the SIT4Energy project	X	X	
Press releases published	X	X	
Software re-used in future projects			X
Licensing of software components to SMEs and Industry partners.			X

Assessment of SIT4Energy applicability to other sustainability challenges		X	
Re-use of core developments in different sustainability areas			X
Identified actors for exploitation (companies, PA, NGOs...)	X		
Presentation of results/assets to potential exploiters	X	X	X

3.5 Pilot-specific activities

This is the process for measuring impact through pilot-specific activities (communication on behalf of pilot related themes, demonstration activities, open pilot workshops, etc.). This process involves reports from pilot partners in the form of pilot scope, objectives, resource, reference group, participants and as well as pilot impact evaluation.

3.6 Activity assessment metrics

3.6.1 Event based metric

Awareness-raising regarding SIT4Energy is expected to be impacted positively by the project representation in relevant events. Events are important means for SIT4Energy to communicate and disseminate the results of its work. As the per project specifications, we expect to be involved in a variety of event formats, ranging from conferences and workshops to events and exhibitions, and to take on all tasks related to event planning and implementation, including, where required, the production of targeted material and support the project with exhibition material. We will represent SIT4Energy at a number of events aiming to promote and disseminate, by all means and tools, all relevant information that will increase the project visibility. Participation in events is also an opportunity to increase and strengthen the network of relevant parties interested in becoming target audiences and intermediaries becoming multipliers of SIT4Energy.

SIT4Energy plans active presence in various events (workshops, exhibitions, info days) at least twice per project year.

3.6.1.1 Event based strategy

The following figure presents the events-based strategy to be followed within SIT4Energy.

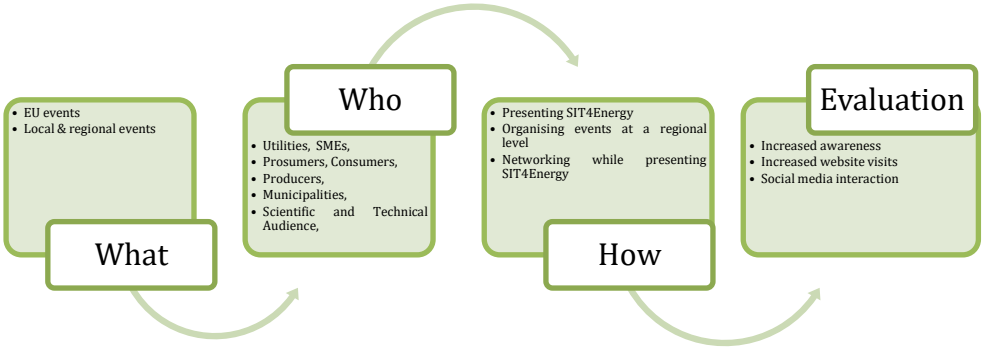

Figure 4. SIT4Energy events-based strategy

Event material will be utilised within the course of the project since it offers high visibility at selected events in combination with other promotional material. The choice of the type of material will be

depending on the event, timing, available space. In the list of materials available will be a medium size stand or posters of smaller scale. All products serve the same scope and will be available to the partners in German, Greek and English languages upon the request. Apart from this SIT4Energy will prepare brochures/leaflets/fact sheet (both online and hard copy versions) to be distributed in events. In our view, the hard copy can prove valuable in promoting the visual identity, style and promotional positioning of the project since an engaging design will be adopted to attract a reader's attention (i.e. big headline, strong visuals, and a distinct call to action).

These materials will be developed once at the beginning of the project and then depending on the event requirements. In addition to this SIT4Energy newsletter is envisioned be released once per project year.

Figure 5. Initial Design of the project poster and fact sheet

3.6.2 Publication based metric

SIT4Energy partners will frequently present and publish project results in the most known scientific journals and participate in the most widely attended international conferences. In this way the project results will be presented to students, university staff and the research community targeted industry representatives, thereby increasing awareness and adoption of SIT4Energy results. The indicative list of scientific journals in has been already identified and D5.4 "Dissemination & Awareness Plan".

SIT4Energy plans to have at least two paper publications per project year.

3.7 Web based metric

3.7.1 SIT4Energy website

The project website will primarily act as an information exchange platform for measured outcomes, project related events, results from the participating pilots and contact information to connect with the right people and to exchange information. Information will be offered by many means in three different languages and the necessary features incorporated, will support the information flow from one user to another, thus creating a network of social activity. The importance of social networking relates to the outcome of increasing traffic to the site as well as increasing awareness of the site purpose and the initiative itself. The website has a simple structure. At a later stage of SIT4Energy

further sections can be introduced. For the project website, it is essential to keep the content fresh, accurate, and up-to-date to ensure its sustainability since consistency in updating a website's content is the only way to maintain a competitive edge. Allowing access to interested users who will populate different areas of the site with content is foreseen. More information about the SIT4Energy website can be found in D5.3 "SIT4Energy Fact Sheet and web site".

Google Analytics will be used to analyse visitor traffic and behaviour. Google Analytics is a powerful tool to monitor the results of the communication strategy and to get a complete picture of the audience, in terms of: number of hits; number of unique visitors; traffic sources; location, etc.

3.7.2 SIT4Energy Social Media

Constant communication and regular promotion of the SIT4Energy activities and news to the various communities through the social media will be continuously pursued. Currently SIT4Energy has an active presence in Twitter which is one of the most popular social media. The account (@sit4energy) is already in use as a news dissemination tool, particularly for breaking news, events announcements, calls and as a means for enlarging the SIT4Energy community. Moreover, re-tweets are made of relevant and interesting content from disparate sources. Last but not least, through targeted following of other relevant users SIT4Energy not only gets access to more relevant content and updates, but also acquires more followers.

The account is envisioned to be updated on a regular basis depending on different SIT4Energy events or milestones.

Figure 6. SIT4Energy twitter page

4. Conclusion

This document sets out the general overview of SIT4Energy impact on economics, social & environment entailing it with the project's dissemination, communication and exploitation strategies. It assesses the direct and indirect linkages between the ICT enabled energy-efficiency technologies (as part of the SIT4Energy ecosystem to be delivered) and labour markets, social welfare, environment at both the micro and the macro levels. Given the early stage in the project progress, the novelty of the SIT4Energy platform and its individual elements under development, the presented SIT4Energy impact assessment in this version of the document is preliminary and will be expanded and revised as more specific achievements will be reached during the lifetime of the project. The outcomes of the communication, dissemination and exploitation strategies will be constantly monitored in order to assess the SIT4Energy expected impact to formulate change requirements where necessary. A mid-term evaluation of the strategy will be carried out and will be reported in an intermediate version of D5.6 (M24), while during the last quarter of the project a final evaluation will be implemented, which will feed into the final D5.6 report to be delivered on M36.

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