



Task 51

Solar Energy in Urban Planning

Annex Plan

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1. Definitions

(a) *The building sector and the use of solar energy*

A large portion of the potential for energy efficiency in existing buildings and potential to utilize solar energy still remains unused. Globally, goals and specific targets are set up to reduce our environmental impact on climate and secure future supply of energy. The built environment accounts for over 40% of the world's total primary energy use and 24% of greenhouse gas emissions. A combination of making buildings (refurbishing and new developments) more energy-efficient and using a larger fraction of renewable energy is therefore a key issue to reduce the non-renewable energy use and greenhouse gas emissions. Political statements and directives are already moving towards zero-energy buildings, communities and whole cities. An increased use of solar energy is one important part of the development ahead, where the urban fabric needs to utilize passive solar gains and daylight to reduce the energy use in buildings and for lighting outdoor environments, as well as to improve the inhabitants' comfort indoors and in urban outdoor areas. Also, active solar energy systems integrated in the urban context will enable a supply of renewable energy primarily as heat and electricity, but also of solar cooling, helping cities reach sustainable solutions.

(b) *Scope*

The scope of the Task includes solar energy issues related to

1. New urban area development
2. Existing urban area development
3. Sensitive/protected landscapes (solar fields)

In all three environments listed above, both solar thermal and photovoltaics will be taken into account within this Task. In addition, passive solar will be considered in the urban environment (1 and 2). Passive solar includes passive solar heating, daylight access and outdoor thermal comfort.

Task 51 will not cover the whole complex context of urban planning; in order to achieve a substantial contribution to increased use of solar energy, this Task will focus on how to improve and accelerate the integration of solar energy in urban planning that respects the quality of the urban context. The main work will be on active solar strategies due to a great need of development in this area, related to urban planning.

Issues of thermal storage and the effect on the utility grid can be partially approached as boundary conditions and framework. Thermal storages, including material development and system integration, are already addressed in the IEA SHC Task 42 and IEA SHC Task 39.

A new IEA SHC Task is under development focusing on the role of solar thermal in energy supply systems in urban environments, with utilities as the main target group. Task 51 will link to this work.

The ongoing work carried out within the IEA SHC Task 40, Towards Net Zero Energy Solar Buildings, is partly related to Task 51. On an urban and energy system level, Task 40 is dealing with studies of grid interaction (power/heating/cooling) and time dependent energy mismatch analysis. The development of a harmonized international definition framework for the Net Zero Energy Building (NZEB) concept will be useful as a basis for further developments regarding large-scale implications; Net Zero Energy Clusters (NZEC). As the NZEB level is extremely challenging to achieve with high density individual buildings (decreasing solar roof area per m²

floor area while increasing energy demand with every additional floor), strategies must be developed by clustering buildings of various types within net zero energy city quarters or cities. This work has strong links to the international smart city activities. Initial international examples underline the need for planning methods and tools to optimize the interaction on the energy level. The definition framework can be extended to building clusters, city quarters and the city level.

2. Purpose and Objectives

The content of this project was defined based on knowledge from IEA SHC Tasks, the IEA PVPS and ECBCS programmes and other international and national projects. Task 51 was initiated by the IEA SHC Task 41 participants. Task 41 dealt with high quality architecture for buildings integrating solar energy systems, as well as improving the qualifications of architects, their communication and interaction with engineers, manufactures and clients. The main work was, however, at a building scale. During the Task 41 work, it became evident that a whole new Task was needed to address the urban scale of solar utilization, with urban planners, decision makers and architects as the main target groups.

The main objective of Task 51 is to provide support to urban planners, authorities and architects to achieve urban areas and eventually whole cities with architecturally integrated solar energy solutions (active and passive), highly contributing to cities with a large fraction of renewable energy supply. This includes the objective to develop processes, methods and tools capable of assisting cities in developing a long term urban energy strategy. Heritage and aesthetic issues will be taken into account. Also, the goal is to prepare for and strengthen education at universities on solar energy in urban planning, by testing and developing teaching material for programmes in architecture, architectural engineering and/or urban planning. The material will also be useful for post graduate courses and continuing professional development (CPD).

To achieve these objectives, work is needed in four main topics:

- A: Legal framework, barriers and opportunities for solar energy implementation
- B: Development of processes, methods and tools
- C: Case studies and action research (implementation issues, test methods/tools/processes, test concepts as e.g. NZEB, NZEC)
- D: Education and Dissemination

Task 51 will require a dialogue and cooperation with municipalities in each participating country. This ensures good communication with different key actors, gives the possibility to develop and test methods and tools, to document good examples of how to work (methods and processes) with solar energy in urban planning, and to show inspiring examples of urban planning with solar energy integration. The municipalities are also a target group in the dissemination phase.

The main objectives of the Task are subdivided into four key areas and involve:

A: Legal framework, barriers and opportunities

- Investigate current legal and voluntary frameworks, barriers and urban planning needs of specific relevance to solar energy implementation.
- Review existing targets and assess the practical potential of solar energy in urban environments to support urban planning design and approval processes.
- Recommend areas in need of attention to improve the uptake of solar energy in urban planning.

B: Processes, methods and tools

- Identify factors among existing processes and supportive instruments (knowledge/methods/tools) that enable decision processes for solar energy integration in urban planning, and to elucidate development needs.
- Develop new and/or improve urban planning processes in order to facilitate passive and active solar strategies in urban structures; both in new and existing urban area developments as well as in sensitive/protected landscapes.
- Develop new and/or improve supportive instruments (knowledge/methods/tools) and show how guidelines along with existing and new supportive instruments regarding active and passive solar energy can be incorporated and at what stage in the planning process.

C: Case studies and action research

The main objective is to facilitate replicability of successful practice. Complementing objectives are to:

- Coordinate a database of best practice case studies and stories across Subtask topics.
- Establish and manage action research in each participating country.
- Facilitate and document the development and testing of supportive instruments and process models in at least one city in each participating country, in cooperation with local decision makers.

D: Education and dissemination

- Strengthen the knowledge and competence in solar energy and urban planning of relevant stakeholders such as universities and professionals.
- Develop and make available education material based on e.g. results from the Task. Give information on where to find relevant courses.
- Provide for dissemination and education by developing an e-learning platform, integrating methods, tools and case studies.

3. Activities

(a) Main activities

The Task is organized in four main activities/Subtasks, derived from the above described key areas:

Subtask A: Legal framework, barriers and opportunities

Subtask B: Processes, methods and tools

Subtask C: Case studies and action research

Subtask D: Education and dissemination

Subtasks A to C reflect different stages in the urban planning process; Subtask A sets the current boundary conditions for solar integration, deals with the assessment of available potential and elucidates opportunities. Subtask B deals with processes, methods and tools and developments for the applied phase related to specific situations (new development areas, existing urban areas, landscapes). Subtask C focuses on implementation issues; tests of processes, methods and tools, tests of concepts (e.g. NZEB/NZEC) through case stories and showing good examples as case studies. Finally, Subtask D covers the dissemination focused on tertiary education and continuing professional development (CPD).

(b) Sub activities

The following activities will be performed in the four Subtasks:

Subtask A: Legal framework, barriers and opportunities

- A.1. Review of current legal and voluntary frameworks and barriers:
 - A.1.1. Review on existing urban planning legislations and voluntary initiatives (Subtask A) and on existing urban planning processes (Subtask B) in participating countries.
 - A.1.2. Investigation of urban planning barriers, challenges and needs relevant to the uptake of solar energy implementation.
- A.2. Evaluation of current urban planning solar implementation targets and potential:
 - A.2.1. Review of established targets and approaches taken in setting and achieving these from participating countries.
 - A.2.2. Evaluation of practical potential of solar implementation in urban areas, taking into account irradiation potential and architectural environment.
 - A.2.3. Deliver material to Subtask D on practical potential and opportunities, as part of the common guideline (umbrella document; D.D6).

Subtask B: Processes, methods and tools

- B.1. Review of existing processes and supportive instruments:
 - B.1.1. Review on existing urban planning legislations and voluntary initiatives (Subtask A) and on existing urban planning processes (Subtask B) in participating countries.
 - B.1.2. Identification of needs for improved and/or new supportive instruments (knowledge/methods/tools) and how and at what stage they can be incorporated in the urban planning process.
- B.2. Improvement or development of new supportive instruments (knowledge/methods/tools):
 - B.2.1. Revise and/or develop new supportive instruments based on identified needs.
 - B.2.2. Test revised and/or new supportive instruments in case stories in Subtask C.
 - B.2.3. Use feedback from tests in case stories to improve supportive instruments.
- B.3. Development of process models:
 - B.3.1. Develop one generic pilot process model for each area within the scope, i.e. for new and existing urban area developments as well as for sensitive/protected landscapes.
 - B.3.2. Adjust the generic pilot process model/s to the action research case story in each participating country, and to national and regional prerequisites. Adjusted models to be tested in Subtask C.
 - B.3.3. Improve the generic pilot process model/s after testing in Subtask C and receiving feedback.
 - B.3.4. Provide recommendations and guidelines based on the generic process models and developed supportive instruments (knowledge/methods/tools).

Subtask C: Case studies and action research

- C.1. Coordination of database of best practices:
 - C.1.1. Gathering Key Performance Indicators each Subtask will use to identify relevant case studies, and align them in one template to be filled out for all case studies (link to Subtasks A, B).
 - C.1.2. Collect case study templates from partners, literature and networks, and gather them in one database, (link to Subtasks A, B, D).
 - C.1.3. Publish the database on the website, and facilitate information access for various user groups, amongst others education (link to Subtask D).

- C.2. Documentation of activities supporting the creation and management of action research in each participating country
Subtask C brings together researchers and partner cities during various milestones in the project timeline, by means of:
 - C.2.1. Create a contact network, meeting schedule and objectives for researchers and city managers connected to the action research (link to Subtasks A, B, D).
 - C.2.2. Organise and document problem definition/visioning workshops with the participating cities (link to Subtasks A, B, D).
 - C.2.3. Organise and document feedback sessions to assess the relevance and added value of the results generated in each Subtask (link to Subtasks A, B, D).
 - C.2.4. Identify and document additional support activities for integration of solar energy in the participating cities: meetings, public hearings, exhibitions, development of planning and regulatory documents, etc. (link to Subtasks A, B, D).

- C.3. Test supportive instruments and process models:
 - C.3.1. Facilitate and document testing of supportive instruments in each participating city.
 - C.3.2. Facilitate and document testing of process models in each participating city.

Subtask D: Education and dissemination

- D.1. State-of-the-art on education:
 - D.1.1. Screen the state-of-the-art in higher education regarding solar energy in urban planning in participating countries.
 - D.1.2. Collect the national/regional state-of-the-arts, analyse the results and identify development needs.

- D.2. Education material:
 - D.2.1. Test and evaluate existing teaching material in different courses/academic programmes and develop new material.
 - D.2.2. Select representative case studies and case stories. Learning through analysing and documenting the process and developments.
 - D.2.3. Provide education material, e-learning activities, tools etc. and make available through an e-learning platform.

D.3. Dissemination:

- D.3.1. Organise workshops with students, experts and different stakeholders.
- D.3.2. Organise an international summer school with experts and students from different universities and countries.
- D.3.3. Develop and coordinate the e-learning platform.
- D.3.4. Continue update the SHC Task 41 website on innovative solar products.
- D.3.5. Coordinate the preparation of the best practise guidelines for urban planning with solar energy as an “umbrella document” (joint with Subtask A, B, C). Link to the results and deliverables from all Subtasks.

(c) Case Studies, Case Stories and Action Research

Every participating country should contribute with at least one (1) case study/story. While a Case Study represents a “steady-state” description of an interesting example, a Case Story includes the dimension of time and lessons learnt, with descriptions of processes, tests of methods and tools, and may also include results from “action research”. Case studies/stories will be used by all Subtasks, and Subtask C will ensure a dialogue with key actors. Subtask C will also be responsible for a database of best practices, as a common platform for all Subtasks.

Action Research is a reflective process of progressive problem solving led by individuals working with others in teams or as part of a "community of practice" to improve the way they address issues and solve problems. Action research involves the process of actively participating in an organization change situation whilst conducting research. Action research is part of Subtask C.

(d) Seminars and Workshops

Seminars or workshops will be held in conjunction with at least four (4) Task meetings. The seminars/workshops will be organized in the host country of the meeting and relevant target groups will be invited.

In addition, minimum one (1) local seminar or workshop will be held in each country/region to get input to the work and/or to disseminate results from the Task or Subtasks. These seminars/workshops will be organized by Task participants from the specific country.

(e) Task Website and Publications

An overall description of the Task will be available on the Task Website. All main publications/deliverables will be posted on the Task Website or made available via a link, for free access or purchase.

4. Expected Results/Deliverables

The main deliverables, allocated to the four Subtasks, will be:

Subtask A: Legal framework, barriers and opportunities

- D.A1. Review on existing urban planning legislations and voluntary initiatives (Subtask A) and on existing urban planning processes (Subtask B) in participating countries.
- D.A2. Report on the barriers, challenges and needs of urban planning for solar energy implementation.
- D.A3. Report on current solar energy targets and assessment of solar energy potential in urban areas from participating countries.

Subtask B: Processes, methods and tools

- D.B1. Review on existing urban planning legislations and voluntary initiatives (Subtask A) and on existing urban planning processes (Subtask B) in participating countries.
- D.B2. Improved and/or new supportive instruments (knowledge/methods/tools).
- D.B3. Guidelines; Presentation of developed generic process models with recommendations and guidelines on how to use them when adjusting for local planning, based on lessons learnt from Subtask C, as well as recommendations of needs for improved or new supportive instruments (knowledge/methods/tools).

Subtask C: Case studies and action research

- D.C1. Database of best practices.
- D.C2. Documentation of activities supporting the creation and management of action research in each participating country: exhibitions, public hearings, quality programmes, jury work, presentations to decision makers, interviews, legislation work, creation of incentives etc.
- D.C3. Documentation reports of testing of supportive instruments in partner cities: preparation, implementation and assessment of results (link to Subtask B).

Subtask D: Education and dissemination

- D.D1. Report on the state-of-the-art in education regarding urban planning with solar energy, for countries participating in the Subtask.
- D.D2. Make available and inform about teaching material/packages for tertiary education and for CPD.
- D.D3. Carry out seminars, workshops, summer schools and symposia, which support the knowledge exchange.
- D.D4. A web-based learning platform.
- D.D5. Website on innovative solar products.
- D.D6. Best practice guidelines for urban planning with solar energy based on, and referring to, developed processes, methods, tools, strategies and case studies/stories – presented in an “umbrella document” with links to Task results and deliverables (joint with all Subtasks).

5 Rights and Obligations of the Participants

In addition to the obligations enumerated in Article 4 of the Implementing Agreement:

- (a) A Participant must undertake and complete all agreed activities and contribute to all or to a specific of the tasks outlined in Section 3 and 4 of this Annex in a timely manner.
- (b) Each Participant must actively participate in working meetings and other activities such as seminars and workshops.
- (c) Attendance at Experts meetings of the Task will be mandatory. Task meetings will be carried out at intervals of approximately six months. Experts meetings may be accompanied by national workshops dedicated to target audiences of the Task, mainly from the national industry of the host country of the Experts meeting.
- (d) Each Participant shall provide timely, detailed reports on the results of their work carried out to the Subtask Leader and Operating Agent.
- (e) Every six months, before each Expert meeting, each Participant shall provide a brief status report of their work including a list of publications and organized seminars/workshops.
- (f) Each Participant must contribute to one or more Task deliverables and shall participate in the editing and reviewing of draft reports and other outputs of the Task and Subtasks.
- (g) *Individual Financial Obligations*
Each country will bear the costs of its own participation in the Task, including reporting and necessary travel costs. Task meetings will be held twice annually and hosted in turn by Participants. The cost of organizing meetings will be paid by each Participant to the host, by a meeting fee.
- (h) *Task-Sharing Requirements*
The Participants agree on the following funding commitment:
 - (1) Each Participant (country) will contribute to this Task a minimum of 4 person months per year of the Task (corresponding to 33% of full time work for one person). This means that each participating country shall commit to the Task a minimum of 16 person months over the period of 4 years.
 - (2) Participation in the Task requires participation in at least one of the Subtasks.
 - (3) Subtask Leaders will contribute with a minimum of 4 person months per year for the duration of the Subtask.
 - (4) The Operating Agent will contribute with a minimum of 6 person months per year to the Task.
 - (5) Participation may partly involve funding already allocated to a national (or international) activity, which is substantially in agreement with the scope of work outlined in this Annex.
 - (6) Aside from providing the resources required for performing the work of the Subtasks in which they are participating, all Participants are required to commit the resources necessary for activities which are specifically collaborative in nature and which would not be part of activities funded by national or international sources. Examples include the preparation for and participation in Task meetings, co-ordination with Subtask Participants, contribution to the documentation and dissemination work and Task related R&D work which exceeds the R&D work carried out in the framework of the national (or international) activity.

The level of effort to be contributed by each country will be specified in a "Letter of National Participation" which is signed by the Operating Agent and the Executive Committee representative within 3 months from the start date of the Task.

6. Management

6.1 Operating Agent

- (a) Lund University (Sweden), acting through Maria Wall, is designated as Operating Agent.
- (b) In addition to the rights, obligations and responsibilities enumerated in the main body of the Implementing Agreement and the organisation of the work under this Annex enumerated in Section 5, the Operating Agent shall:
 - (1) Be responsible for the overall management of the Task, including overall co-ordination and communications with the Executive Committee.
 - (2) Prepare the detailed Programme of Work for the Task in consultation with the Subtask Leaders and the Participants and submit the Programme of Work for approval to the Executive Committee.
 - (3) Provide semi-annually, periodic reports to the Executive Committee on the progress and the results of the work performed under the Programme of Work.
 - (4) Manage the preparation and distribution of the results described in Section 4 in this Annex.
 - (5) At the request of the Executive Committee organise workshops, seminars, conferences and other meetings.
 - (6) Provide to the Executive Committee, within six months after completion of all work under the Task, a final report for its approval and transmittal to the Agency.
 - (7) In co-ordination with the Participants, use its best efforts to avoid duplication with activities of other related programmes and projects implemented by or under the auspices of the Agency or by other competent bodies.
 - (8) Provide the Participants with the necessary guidelines for the work they carry out and report with minimum duplication.
 - (9) Perform such additional services and actions as may be decided by the Executive Committee, acting by unanimity.

6.2 Subtask Leaders

- (a) A Subtask Leader shall be a Participant that provides to the Subtask a high level of expertise and undertakes substantial research related to the Subtask.
- (b) The Subtask Leaders shall be proposed by the Operating Agent and designated by the Executive Committee, acting by unanimity of the Participants. Changes in the Subtask Leaders may be agreed to by the SHC Executive Committee, acting by unanimity of the Participants.
- (c) In addition to the obligations enumerated in Section 5 of this Annex, the Subtask Leader for each of the Subtasks shall:
 - (1) Assist the Operating Agent in preparing the detailed Programme of Work.
 - (2) Co-ordinate the work performed under that Subtask.
 - (3) Actively participate in the dissemination activities.
 - (4) Subtask leaders may arrange, direct and provide summaries of Subtask meetings and workshops in between or in association with Task meeting.
 - (5) Provide the Operating Agent with timely written summaries of Subtask work, action items and results after each Task meeting.
 - (6) Edit technical reports resulting from the Subtask and organize their publication.
 - (7) Collaborate with the Operating Agent and other Subtasks and contribute to the preparation, production and distribution of the results described in Section 4 in this Annex within the framework of the Task dissemination plan.

6.3 Meetings

There will be Experts meetings of the Task at intervals of approximately six months. Subtask Leaders may arrange meetings in between or in association with Experts meetings of the Task. Attendance at the Experts Meetings of the Task will be mandatory.

7. Admissions, Participation and Withdrawal of Participants

In addition to the specific obligations, the Operating Agent will produce, promote and distribute the results of the Task. The Participants will support these activities by contributing respective papers and by dissemination activities financed by the individual Participants.

8. Information and Intellectual Property

For purpose of this Annex, in case of conflict with the provisions of the Implementing Agreement, the following provisions shall prevail:

- (a) For arising information regarding inventions the following rules shall apply:
 - (1) Arising information regarding inventions shall be owned in all countries by the inventing Participant. The inventing Participant shall promptly identify and report to the Executive Committee any such information along with an indication whether and in which countries the inventing Participant intends to file patent applications.

- (2) Information regarding inventions on which the inventing Participant intends to obtain a patent protection shall not be published or publicly disclosed by the Operating Agent or the other Participants until a patent has been filed, provided, however, that this restriction on publication or disclosure shall not extend beyond twelve months from the date of reporting of the invention. It shall be the responsibility of the inventing Participants to appropriately mark Task reports that disclose inventions that have not been appropriately protected by filing a patent application.
- (b) The inventing Participant shall license proprietary information arising from the Task for non-exclusive use as follows:
- (1) To participants in the Task:
 - a. On the most favourable terms and conditions for use by the Participants in their own country.
 - b. On favourable terms and conditions for the purpose of sub-licensing others for use in their own country.
 - (2) Subject to sub-paragraph a.1 above, to each Participant in the Task for use in all countries, on reasonable terms and conditions.
 - (3) To the government of any Agency Member country and nationals designated by it, for use in such country in order to meet its energy needs.

Royalties, if any, under licenses pursuant to this paragraph shall be the property of the inventing Participant.

9. Entry in Force, Term and Extension

This Annex shall enter into force on 1st of May 2013 upon the date the IEA Executive Director received the second Notice of Participation, and shall remain in force for a period of four years until 30th of April 2017. At the conclusion of that period, this Annex can be extended by at least two Participants, acting in the Executive Committee, for a period to be determined at that time, provided that in no event shall the Annex continue beyond the current term, or actual termination, of the Implementing Agreement.