ARV

CLIMATE POSITIVE CIRCULAR COMMUNITIES

D10.8 A BLUEPRINT FOR PLANNING, (RE)DESIGN, (RE)CONSTRUCTION, OPERATION, AND USE OF CLIMATE POSITIVE CIRCULAR COMMUNITIES

WP 10 COMMUNICATION, DISSEMINATION, AND STAKEHOLDER OUTREACH

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31.12.2022

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036723

PROJECT INFORMATION

Project acronym	**ARV[1]**
Project title	Climate Positive Circular Communities
Project number	101036723
Coordinator	Norwegian University of Science and Technology / Inger Andresen
Website	www.GreenDeal-ARV.eu

DOCUMENT INFORMATION

Deliverable Number and Title	D10.8 A Blueprint for Planning, (Re)Design, (Re)Construction, Operation, and Use of Climate Positive Circular Communities			
Due Month	Month 12 (December 2022)			
Work Package Number and Title	WP 10 Communication, Dissemination, and Stakeholder Outreach			
Task number and Title	Task 10.3 ARV Communication channels and dissemination material			
Dissemination Level	PU = Public			
Date of Delivery	31.12.2022			
Lead Author	Inger Andresen, Norwegian University of Science and Technology (NTNU)			
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Reviewers	Veronika Schropfer, ACE			
Status	Final DRAFT version (Pending European Commission approval)			
Revision Log	**Version**	**Author**	**Main changes**	**Date**
	V.01	Inger Andresen	First draft	10.12.2022
	V.02	Veronika Schropfer	Minor edits	16.12.2022
	V.03	Inger Andresen	Final version	20.12.2022

[1] ARV is a Norwegian word meaning "heritage" or "legacy". It reflects the emphasis on circularity, a key aspect in reaching the project's main goal of boosting the building renovation rate in Europe.

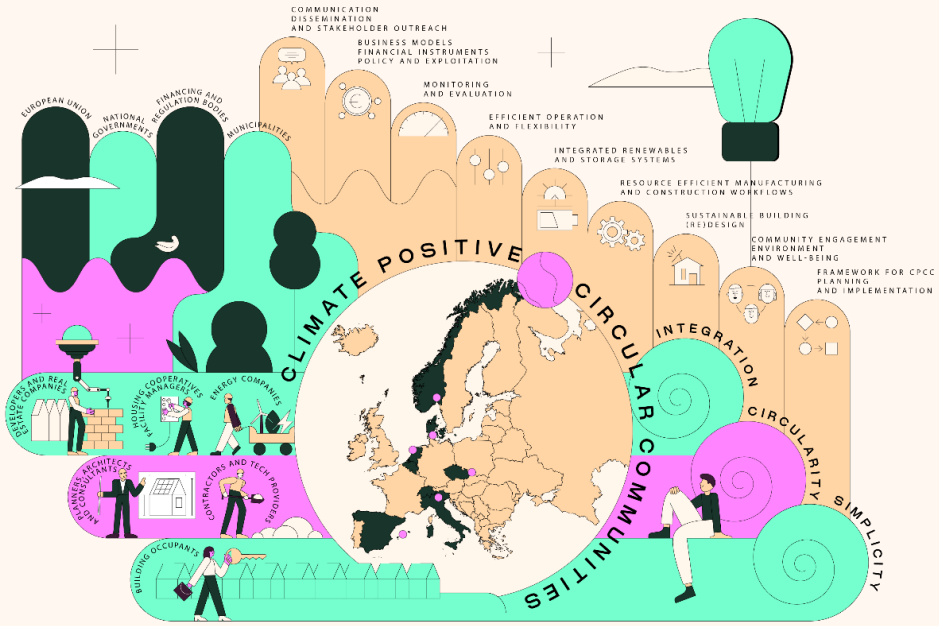
ABOUT THE ARV PROJECT

The vision of the ARV project is to contribute to speedy and wide scale implementation of Climate Positive Circular Communities (CPCC) where people can thrive and prosper for generations to come. The overall aim is to demonstrate and validate attractive, resilient, and affordable solutions for CPCC that will significantly speed up the deep energy renovations and the deployment of energy and climate measures in the construction and energy industries. To achieve this, the ARV project will employ a novel concept relying on a combination of 3 conceptual pillars, 6 demonstration projects, and 9 thematic focus areas.

The 3 conceptual pillars are integration, circularity, and simplicity. **Integration** in ARV means the coupling of people, buildings, and energy systems, through multi-stakeholder co-creation and use of innovative digital tools. **Circularity** in ARV means a systematic way of addressing circular economy through integrated use of Life Cycle Assessment, digital logbooks, and material banks. **Simplicity** in ARV means to make the solutions easy to understand and use for all stakeholders, from manufacturers to end-users.

The 6 demonstration projects are urban regeneration projects in 6 locations around Europe. They have been carefully selected to represent the different European climates and contexts, and due to their high ambitions in environmental, social, and economic sustainability. Renovation of social housing and public buildings are specifically focused. Together, they will demonstrate more than 50 innovations in more than 150,000 m² of buildings.

The 9 thematic focus areas are 1) Effective planning and implementation of CPCCs, 2) Enhancing citizen engagement, environment, and well-being, 3) Sustainable building re(design) 4) Resource efficient manufacturing and construction workflows, 5) Smart integration of renewables and storage systems, 6) Effective management of energy and flexibility, 7) Continuous monitoring and evaluation, 8) New business models and financial mechanisms, policy instruments and exploitation, and 9) Effective communication, dissemination, and stakeholder outreach.



The ARV project is an Innovation Action that has received funding under the Green Deal Call LC-GD-4-1-2020 - Building and renovating in an energy and resource efficient way. The project started in January 2022 and has a project period of 4 years, until December 2025. The project is coordinated by the Norwegian University of Science and Technology and involves 35 partners from 8 different European Countries.

EXECUTIVE SUMMARY

This report provides a first framework or background for a guideline on how to plan, design, construct, operate, and evaluate Climate Positive Circular Communities (CPCCs). The guideline will eventually be based on the work carried out, lessons learned, and best practice from all activities in the ARV project. The guideline should be useful for all stakeholders involved in the implementation of CPCCs, ranging from planners and architects to product and service providers, developers, owners, and public authorities. It should provide easily accessible information about the central topics of CPCCs, tailored to the different users and contexts.

This is the first version of the report, which will be updated annually during the course of the ARV project, to make a complete guideline at the end of the project. Since the project has only been running for one year, there is currently not many results to be included in the report. This first version therefore simply provides a summary of upcoming deliverables that will be the basis for providing the guidelines, organized in the following chapters:

1) The Assessment Framework – describing the Key Performance Indicators to guide the planning, design, and evaluation of CPCCs.
2) Sustainable Planning and Building Re(Design) – describing the processes for planning of design of CPCCs.
3) Resource Efficient (Pre)Manufacturing and Construction – describing the workflows for manufacturing and construction of CPCCs.
4) Integrated Renewables and Storage Systems – describing the design, operation, and performance of the systems
5) Efficient Operation and Flexibility – describing methods and tools for efficient operation and managing of energy flexibility in CPCCs.
6) Methods and Tools – describing method and tools for analyzing environmental, social, and economic impacts of CPCCs.
7) Business Models and Financial Instruments - describing different tools and instruments to be used for the efficient implementation of CPCCs in Europe.
8) Project Examples - providing best practice examples from the 6 real-life demonstration projects of ARV.

TABLE OF CONTENTS

1. INTRODUCTION

This report describes a first framework with the background for making a guideline on how to plan, design, construct, operate, and evaluate Climate Positive Circular Communities. The guideline will be based on the work, lessons learned, and best practice from all the activities in the ARV project.

This is the first version of the report, which will be updated annually during the course of the ARV project. Since the project has only been running for one year, there is currently not much results to include in the report. However, the report provides an overview of upcoming deliverables that will be the basis for providing guidelines.

2. OBJECTIVES

The objective of this report is to provide a first framework for a guideline (called Blueprint) on how to plan, design, construct, operate, and evaluate Climate Positive Circular Communities. The guideline should be useful for all stakeholders involved in the implementation of CPCCs, ranging from planners and architects to product and service providers, developers, owners, and public authorities.

3. MAIN TOPICS OF THE BLUEPRINT

This chapter provides and overview of the main topics to be included in the Blueprint. The topics are based on the main work packages and tasks of the ARV project and will be populated with results from the work within the project, see Figure 1.

The different topics are related to each other in different ways and should be described and organized to be easily accessible and comprehensible to different users and contexts. It is not yet decided in detail how this will be done, but the Blueprint should be organized in such a way that users can search for topics that they are interested in and get relevant tips and suggestions that are tailored to their needs and get access to relevant resources for further information. To facilitate this in the most effective way, we are considering making an interactive digital guideline as a final product.

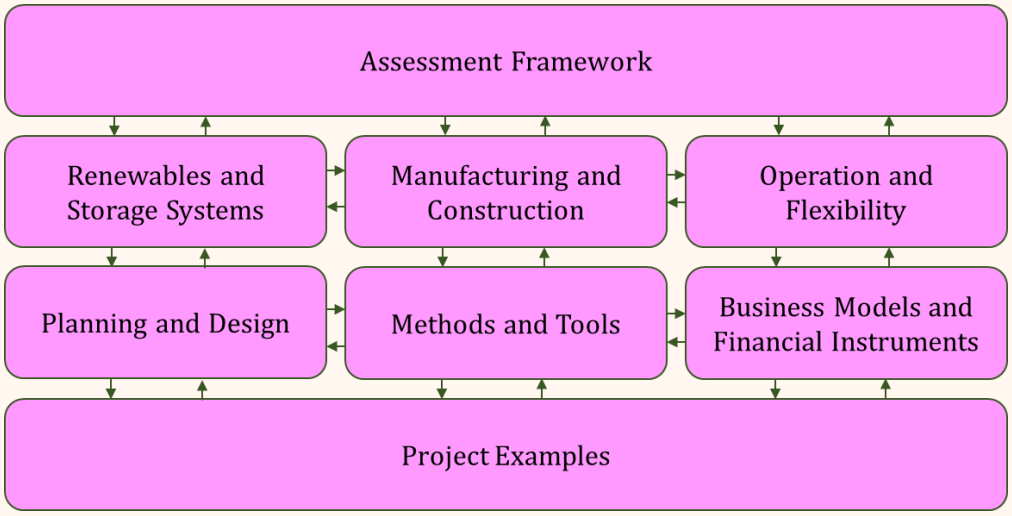


***Figure 1**. Examples of main topics to be included in the Blueprint.*

For this first version of the report, we have organized the chapters according to the main work packages and activities in the ARV project, as follows:

Chapter 3.1 The Assessment Framework – describing the Key Performance Indicators to guide the planning, design, and evaluation of CPCCs.
Chapter 3.2 Sustainable Planning and Building Re(Design) – describing the processes for planning of design of CPCCs.
Chapter 3.3 Resource Efficient (Pre)Manufacturing and Construction – describing the workflows for manufacturing and construction of CPCCs.
Chapter 3.4 Integrated Renewables and Storage Systems – describing the design, operation, and performance of the systems integrated n CPCCs.
Chapter 3.5 Efficient Operation and Flexibility – describing methods and tools for efficient operation and managing of energy flexibility in CPCCs.
Chapter 3.6 Methods and Tools – describing method and tools for analyzing environmental, social, and economic impacts of CPCCs.
Chapter 3.7 Business Models and Financial Instruments - describing different tools and instruments to be used for the efficient implementation of CPCCs in Europe.
Chapter 3.8 Project Examples - providing best practice examples from the 6 real-life demonstration projects of ARV.

For now, the chapters simply include a collection of the main ARV deliverables that will the basis for the guidelines. In the final Blueprint, the topics will be organized according to different user's needs, as described above.

3.1. THE ASSESSMENT FRAMEWORK

This chapter includes an overview of the goals and KPIs as defined in the ARV assessment framework for CPCCs. The framework is described in the report 'D2.1 Assessment Framework for CPCC', that was delivered in September 2022. The framework is currently being tested in the ARV demo projects and will be updated based on the lessons learnt during the implementation in the ARV CPCCs. A Climate Positive Circular Community (CPCC) is defined as an urban area which aims to achieve net zero greenhouse gas emissions, enable energy flexibility, and promote a circular economy and social sustainability. The CPCC concept focuses strongly on the interaction and integration between new and regenerated buildings, users, and energy systems, facilitated by ICT to provide attractive, resilient, and affordable solutions for citizens. The specific goals set for the ARV CPCCs are shown in Table 1.

***Table 1**. The main goals for the CPCCs in ARV.*

Assessment criteria	Goals for new constructions	Goals for renovated buildings
Energy	**At least 50% reduction in energy needs** compared to current country building code. **Positive energy** level based on primary energy	**At least 50% reduction in energy needs** compared to pre-renovation levels. At least **nZEB** standard.
Indoor environment quality	High levels of indoor environment quality according to EU norms.	**At least 30% improvement** compared to pre-retrofitting levels according to EN 16798-1:2019
Noise and dust levels	According to the EU health, safety, and environment standards.	**At least 30 % reduction** in occupant disruption during retrofitting compared to local current practice
Embodied emissions	**At least 50% reduction** compared to local current practice	
Construction/retrofitting time	**At least 30% reduction** compared to local current practice	
Life Cycle Costs	**At least 20% reduction** for the community compared to local current practice	

Construction/retrofitting costs	**At least 30% reduction** compared to local current practice
Circularity	The CPCC should be designed to support the transition to a circular economy by implementing regenerative systems in which resource input and waste, emissions, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops. The building components and systems are designed to be long-lasting, easy to repair, reused, remanufactured, refurbished, and recycled. Where possible, local and second-hand materials are used.
Social sustainability	CPCCs focus on people, i.e., their specific needs, interaction, and wellbeing, and provide good indoor and outdoor environmental conditions, spatial qualities and equal accessibility for persons with disabilities and senior citizens.

***Figure 2**. The main categories of key performance indicators for CPCCs, along with sub-indicators (ref D2.1).*

A clear formulation of performance goals with associated Key Performance Indicators (KPIs) will help to guide the involved actors throughout the planning, design, construction, and operation phases, and is a prerequisite for a successful outcome. The ARV assessment framework goes beyond the traditional sustainability assessment of buildings, to highlight the importance of a neighbourhood-based approach in a life cycle perspective taking into account architectural qualities and circularity aspects. The ARV assessment framework focuses on the energy, environmental, economic, well-being and social impacts of CPCC implementation, emphasising circularity and architectural qualities. Hence, the main categories of Key Performance Indicators (KPIs) selected for the ARV assessment framework are *energy, environment, social, architecture, circularity, and economics*, see Figure 2. There are several sub-

indicators for each of the 5 categories, as shown in the figure, and the procedures for assessing and the different indicators is provided in the report 'D2.1 Assessment Framework for CPCC'. Some of the indicators are quantitative and may be calculated or measured directly, other are more qualitative and need other methods of assessment, such as user surveys or expert evaluation. This is further described in D8.1 'Report on the monitoring, evaluation, and impact assessment' to be delivered in Dec 2022, and the indicators will be tested out in the ARV demo projects in the months to come.

3.2. SUSTAINABLE PLANNING AND BUILDING (RE)DESIGN

This chapter will include descriptions of planning and design processes to be applied for CPCCs. It will be based mainly on the following deliverables:

D2.4 *Application of tools for large-Scale Retrofitting actions. Uses cases and guidelines for replicability,* to be delivered in M42.
D2.5 *Application of tools for implementation of Citizen Energy Communities. Uses cases and guidelines for replicability,* to be delivered in M42.
D2.6 *Demos of Virtual Reality Environments* to be delivered in M36.
D2.7 *Description and lessons learnt from training & awareness sessions using Virtual Environments*, to be delivered in M48.
D3.3 *CPCC Living Labs reports.* First report to be delivered in M24 and updated in M36 and M48.
D3.4 *Analysis of citizen engagement tools and processes using a citizen science approach* to be delivered in M40.
D3.5 *Community-scale citizen engagement strategy and tools for the renovation wave,* to be delivered in M48.
D4.1 *Design guidelines of zero-emission and positive energy buildings in a climate positive energy neighbourhood in Oslo.* First version to be delivered in M 12 and updated in M24 and M36.
D4.2 *Design configuration for a modular, scalable, integrated retrofitting concept for Positive Energy Mid- & Highrise Buildings embedded in a green neighbourhood in Utrecht.* First version to be delivered in M 12 and updated in M24 and M36.
D4.3 *Design guidelines for zero-emission & positive energy refurbished and new buildings in Palma.* First version to be delivered in M 12 and updated in M24 and M36.
D4.4 *Design guidelines for the zero-emission & positive energy renovation of the Health Care Centre in Karviná.* First version to be delivered in M12 and updated in M24 and M36.
D4.5 *Design guidelines of timber-based construction & renovation of small-medium size buildings in Trento.* First version to be delivered in M12 and updated in M24 and M36.
D4.6 *Design guidelines of new & retrofitting of existing buildings as zero-emission positive energy-buildings in climate positive circular communities,* to be delivered in M40.

3.3. RESOURCE EFFICIENT (PRE)MANUFACTURING AND CONSTRUCTION

This chapter will include a description of methods and processes related to the manufacturing and construction of CPCCs. It will be based mainly on the following deliverables:

D5.1 *Manufacturing configurator for high-rise apartment buildings to directly start production (File2Factory) process partly validated in participating European demo countries,* to be delivered in M24.
D5.2 *Workflow analyses and advise on how to move towards more prefabricated components and reduce work on-site,* to be delivered in M36.
D5.3 *Resource Efficient (Pre)Manufacturing & Construction Workflows – Demo Utrecht,* to be delivered in M48.

D5.4 *Resource Efficient (Pre)Manufacturing & Construction Workflows – Demo Palma,* to be delivered in M48.
D5.5 *Resource Efficient (Pre)Manufacturing & Construction Workflows – Demo Oslo,* to be delivered in M48.
D5.6 *Resource Efficient (Pre)Manufacturing & Construction Workflows – Demo Karviná,* to be delivered in M48.

3.4. INTEGRATED RENEWABLES AND STORAGE SYSTEMS

This chapter will provide guidelines for integrated design and implementation of renewable energy and storage systems for CPCCs. It will mainly be based on the following deliverables:

D6.1 *Guidelines for integrated design and implementation of RESs and ESSs for buildings'/ neighbourhoods' energy needs in Oslo,* to be delivered in M42.
D6.2 *Guidelines for integrated design and implementation of RESs and ESSs for buildings'/ neighbourhoods' energy needs in Sønderborg,* to be delivered in M26.
D6.3 *Guidelines for integrated design and implementation of RESs and ESSs for buildings'/ neighbourhoods' energy needs in Utrecht,* to be delivered in M44.
D6.4 *Guidelines for integrated design and implementation of RESs and ESSs for buildings'/ neighbourhoods' energy needs in Karviná,* to be delivered in M44.
D6.5 *Guidelines for integrated design and implementation of RESs and ESSs for buildings'/ neighbourhoods' energy needs in Trento,* to be delivered in M46.

3.5. EFFICIENT OPERATION AND FLEXIBILITY

This chapter will provide guidelines on how to efficiently operate CPCCs with respect to optimize the energy and power performance as well as the indoor environment quality and minimize greenhouse gas emission and costs. It will mainly be based on the following deliverables:

D7.6 *Guidelines on descriptions of smartness and flexibility,* to be delivered in M24.
D7.7 *Guidelines on climate zone related design principles,* to be delivered in M32.
D7.8 *Handbook for smart communities,* to be delivered in M42.
D7.9 *Principles for CEC-DSO interaction,* to be delivered in M46.

3.6. METHODS AND TOOLS

This chapter will provide a description of methods and tools for planning, design, construction, operation, and use of CPCCs. It will mainly be based on the following deliverables:

D2.2 *Description of methods and tools for Large-Scale Retrofitting in CPCC,* to be delivered in M18.
D2.3 *Description of methods and tools for CEC in CPCC,* to be delivered in M15.
D2.4 *Application of tools for large-Scale Retrofitting actions. Uses cases and guidelines for replicability,* to be delivered in M42.
D2.5 *Application of tools for implementation of Citizen Energy Communities. Uses cases and guidelines for replicability,* to be delivered in M42.
D2.6 *Demos of Virtual Reality Environments* to be delivered in M36.
D2.7 *Description and lessons learnt from training & awareness sessions using Virtual Environments,* to be delivered in M48.

D3.4 *Analysis of citizen engagement tools and processes using a citizen science approach,* to be delivered in M40.
D3.5 *Community-scale citizen engagement strategy and tools for the renovation wave,* to be delivered in M48.
D8.1 *Monitoring, evaluation, and impact assessment frameworks*, to be delivered in M12
D8.5 *Report on streamlined LCA-LCCA comparing alternative solutions and scenarios. To be delivered in M24.*
D8.7 *Report on Multiple Benefits analysis and assessment, to be delivered n M48.*
D8.8 *Guidelines and recommendations for replication,* to be delivered in M48.

3.7. BUSINESS MODELS AND FINANCIAL INSTRUMENTS

This chapter will provide a description of business models and financial instruments to be used for the efficient implementation of CPCCs in Europe. It will be mainly based on the following deliverables:

D9.2 *Develop catalogue of business and financing models proven in other markets for adaptation in the EU to accelerate the renovation wave.* First version delivered in M6.
D9.3 *Design business model blueprints for energy positive retrofits for different asset classes as modules for replication across the EU,* to be delivered in M36.
D9.4 *Design Platform Based Prosumer Business Models with clear policy and regulatory recommendations,* to be delivered in M41.
D9.5 *Design Building-linked financing instruments for FI adoption in re-estate portfolios,* to be delivered in M36.
D9.6 *Develop green digital bonds guide to scale prosumer flexible energy markets,* to be delivered in M45.
D9.7 *Enable scaling across EU markets of energy positive renovation***,** to be delivered in M46.

3.8. PROJECT EXAMPLES

This chapter will provide descriptions of the six demonstration cases in ARV. It will focus on description of how the different demo cases have achieved the goals and KPIs described in the assessment framework, and show examples of different solutions, strategies, and technologies.

4. CONCLUSION

This report provided an overview of different deliverables and topics of the ARV project that will be used as a basis for providing guidelines tailored for different contexts and stakeholders of the CPCC processes. The organization and streamlining of the guidelines will be further developed and described in upcoming revisions of the report.

FUTURE UPDATES

This deliverable will be updated in month 24 (December 2023, second version), in month 36 (December 2024, third version), and month 48 (December 2025, final version) of the ARV project.

ACKNOWLEDGEMENTS AND DISCLAIMER

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036723.

APPENDIX A – GLOSSARY OF TERMS

Table A.1 *Abbreviations used in the report.*

Abbreviation	Description	References
CPCC	Climate Positive Circular Communities.	See ARV Deliverable D2.1 for a detailed definition of CPCC

PARTNER LOGOS

WWW.GREENDEAL-ARV.EU