



## **RESULTS ORIENTED MONITORING REPORT**

Grant Contract Beneficiary: ***Sapienza University of Rome***

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Partner in the Action: ***Ardhi University Dar es Salaam***

Associate in the Action: ***Dar City Council***

Project title: ***Adapting to Climate Change in Coastal Dar es Salaam***

Project acronym: ***ACC Dar***

Contract number: ***2010/254-773***

Project duration: ***01/02/2011 – 31/08/2014***

Reporting period: ***From 01/07/2013 to 31/12/2013***

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***Data contribution and reviews to the successful submission of this report have been provided by all the project team members***





Individual commitment identification number:	2010/254-773
Title of the Action:	Adapting to Climate Change in Coastal Dar es Salaam
Name of Beneficiary:	DICEA Sapienza University of Rome
Name of Local Partner:	Ardhi University of Dar es Salaam (ARU)
Period Covered by this report	1 <sup>st</sup> of July 2013 – 31 <sup>st</sup> of December 2013

**CONTRACTUAL & FINANCIAL ISSUES:**

Expenditure ratio since start of the project:	82,85% in relation to the total cost of the action, all sources and contingencies included
Expenditure ratio since last payment (<, > 70%):	78,68% in relation to the third instalment of financing
Planned date of submission of next payment request:	1 <sup>st</sup> of September 2014

No relevant issues have arisen related to contractual and financial matters during the semester object of this report.

The third installment of the financing was received at the beginning of June 2013.

The request for an extension by 7 months of the project duration and the related budget addendum have been approved in December. The project end is postponed from 31st of January 2014 until 31st August 2014.

**EXECUTIVE SUMMARY:**

The project rests in its third year. The whole working package 1 “Improve Understanding in Adaptation” is already completed and the methodologies for designing adaptation initiatives, under the working package 2, are in their finalization phase. The methodology to monitor land cover changes, using remote sensing images, and the monitoring of the seawater intrusion phenomena into the coastal shallow watershed are already performed. Those results have been already evaluated by external experts in the respective fields and presented during the two-days International Workshop held in Rome on April 2013. Meanwhile, the definition of the methodology to create scenarios on people’s vulnerability to seawater intrusion and to identify priorities for adaptation progressed. During this reporting period a community-based scenario exercise has been carried out in one of the peri-urban target areas using the participatory backcasting scenario methodology, through the Forum Theatre techniques, to ensure people’s participation in the goals formulation process. The methodology for designing adaptation initiatives adopts CC mainstreaming as a guiding principle. The idea is to integrate CC adaptation concerns into the existing Urban Development and Environment Management (UDEM) plans and programs rather than developing new ad hoc plans for adaptation. During this



semester the guidelines for adaptation mainstreaming into plans have been finalized. and their application to four different kinds of local plans is under development. As regards working package 3 “Build the Capacity of Dar’s Municipalities” a conference was held in Dar es Salaam in September 2013 to present and discuss the adaptation initiatives proposed by the officers involved in the two training cycles during the previous semester. At the moment four LGAs’ plans are under analysis following the guidelines developed for mainstreaming climate change (CC) adaptation.

#### **CONTEXT (EXTERNAL FACTORS):**

The development of the action did not encounter relevant constraints; there have not been changes in the project operating context during the reporting period. All the assumptions described in the log-frame have been fulfilled. In particular the following considerations should be relevant:

- The institutional commitment.

The institutional commitment remains a strong asset to facilitate the implementation of the project activities. 38 officers from 5 government authorities have been actively involved during the whole capacity-building carried out in 2013.

The strong commitment and the availability of the local authorities at all institutional levels involved (DCC, Dar’s municipalities, community leaders and street leaders) remain an asset to secure project goals achievement.

- The community involvement.

Community involvement in the project activities has proven to be successful during the participatory backcasting scenario exercise carried out in Kigamboni ward. The residents participated actively during the workshop and the 10 events of forum theatre. Almost 500 people have attended the events allowing the project team to obtain a wide range of information about “people CC adaptation options and strategies and their link with the issue of the access to land”.

- The partnership.

The project management and coordination team as well as the team of young researchers did not change from the beginning of the project ensuring continuity to the overall structure and activities of the action.

#### **MANAGEMENT (INTERNAL FACTORS):**

The structure and the composition of the **internal project management and coordination** did not change. The activities of the joint working groups are supported and monitored by the Project Manager; their achievements are evaluated by the Project Coordinator and the Local Coordinator.

The project team and the management took into consideration the recommendations held in May 2013 by the external ROM experts, Mr Benjamin Landreau. In particular, during this semester, more efforts than foreseen have been spent working with the LGAs to ensure the successful impact of the capacity-building initiative.



Furthermore the project management in Dar es Salaam has been strengthened for a period of three months.

As from the beginning of the project the internal communication flow between the two partners and among the working group members took place mainly by email, by phone and by in-person meeting several times in Dar es Salaam and in Rome during the semester.

Internal monitoring of the project activities has been carried out by the Project Manager on the basis of performance indicators through analysis of documentation and periodical meetings with the project staff.

Accountability to EU delegation is ensured by submitting the bi-annual ROM and the annual interim narrative and financial report.

Project **specific objectives and results** remained relevant. Achievements have been reached as described in the next two chapters and in the table of the indicators annexed to this report.

#### **Work plan**

Significant efforts were spent during the third year project to carry out successfully the capacity-building involving five government authorities in Dar es Salaam. Some of the activities and the number of the officers involved within the project activities (38) required more time and efforts than it was foreseen at the beginning.

The selection of the participants needed the support and approval by the LGAs' Directors and also the capacity-building strategy was negotiated with them to ensure the officers' participation. After several consultations, it was decided to deliver the training in a residential modality outside Dar es Salaam, in Morogoro, to avoid participants' turnover and drop out. This decision entailed stronger efforts in terms of logistic and coordination for the organization of the whole activity.

Accordingly with the above described needs and the extension of the project duration already approved, some of the activities have been rescheduled. An updated work-plan has been already submitted to the EU Delegation.

#### **PROGRESS IN ACHIEVING OBJECTIVES:**

Progress towards the specific objectives during the reporting period could be summarized as following.

The activities under WP2 are addressed to the specific objective of developing methodologies for integrating adaptation activities into strategies and plans for UDEM in coastal unplanned and underserviced settlements.

Progress achieved to date includes the calculation of an "Urban Sprawl Indicator", which allows for an easy and rapid evaluation of the expansion of low density built-up areas over time. Those analysis are crucial to understand the relation between land cover change and seawater intrusion and to develop future scenarios on boreholes' salinization, combining trends in urban sprawl with predicted CC effects on local climate parameters. (The choice to focus attention on groundwater condition was made last year as it resulted to be a major issue for the target population's



vulnerability to CC.)

The monitoring of coastal shallow watershed condition and the analysis of the current state of seawater intrusion phenomenon into Dar es Salaam's coastal aquifer as well as the study of its relationships with climatic conditions and urbanization processes were performed. Meanwhile, the definition of the methodology to create scenarios on people's vulnerability to seawater intrusion and to identify priorities for adaptation progressed. It combines the use of a forecasting approach for developing hypotheses regarding the potential future evolution of the seawater intrusion phenomenon with a backcasting approach for defining adaptation objectives at the community level. A community-based scenario exercise has been carried out in one of the peri-urban target areas through the participatory methodology already used under the WP1.

The methodology for designing adaptation initiatives adopts CC mainstreaming as a guiding principle. The idea is to integrate CC adaptation concerns into the existing Urban Development and Environment Management (UDEM) plans and programs rather than developing new ad hoc plans for adaptation. To date the guidelines for adaptation mainstreaming into plans have been finalized and their application to four different kinds of local plans is under development.

The methodologies and tools developed under WP1 and WP2 are oriented toward the WP3 objective of building the capacity of Dar's local authorities for the design of community based adaptation initiatives as part of the implementation of the NAPA action of the United Republic of Tanzania. The activities under WP3 specifically aim to enhance the capacities of Dar es Salaam's LGAs in understanding CC issues related to Dar's coastal plain and peri-urban livelihood systems; in identifying effective measures for supporting the coastal peri-urban inhabitants in their efforts to adapt to CC; and, in integrating them into existing urban development and environmental management strategies and plans.

The capacity-building involved key actors within five local authorities in Dar es Salaam, namely the DCC, the three Municipalities and the Ruvu Basin Authority. Their active participation during the two training weeks already delivered is a strong asset for the final achievement of the WP3 objective. The assessment of four local plans and the formulation of recommendations for mainstreaming CC adaptation concerns into them are progressing.

#### **PROGRESS IN ACHIEVING RESULTS:**

The first expected result (**WP1**), a better understanding of actual and practical ways of addressing CC adaptation in coastal areas of Dar es Salaam, is already achieved by the activities successfully carried out during the past two years of the project.

The second result foreseen by the project is the enhanced development of methodologies for supporting inhabitants of coastal unplanned and underserved settlements in their efforts to adapt to CC (WP2). It includes three main sets of methodologies. Major developments are described here below.

1. Methodologies for monitoring changes in peri-urban settlements



The methodology for the semi-automatic classification of Land Cover, using remote sensing images has been developed by Sapienza University. It was applied to assess Land Cover changes in Dar's settlements over the years 2002, 2004, 2007, 2009 and 2011. A misalignment between population growth and urban area expansion in Dar es Salaam was observed, which indicates the increasing trend of urban sprawl.

A "Semi-automatic Classification Plugin" for QGIS has been developed, which allows for expediting the creation of training areas (ROIs), the classification process, and the post processing phases (accuracy assessment, land cover change).

Using Land Cover classification data sets, population estimates for years 2002 to 2011 have been calculated and compared with the data from official census 2002 and 2012, demonstrating the reliability of estimate method at the regional and the municipal level.

2. Methodologies for exploring CC vulnerability scenarios as regards seawater intrusion phenomenon.

The analysis of the salinization processes in Dar es Salaam's coastal aquifer, and their relationship with environmental parameters, related to climate variability, and anthropogenic factors, related to changes in land cover and the population's water demand, has been performed. The analysis involved the following steps: the assessment of the geological and hydrogeological sketch of the Dar es Salaam coastal plain; the seawater intrusion assessment by hydro chemical methods, through physical and chemical testing of a monitored network of representative boreholes from 2001 to 2012; the analysis of climatic and anthropogenic influences on hydrogeological dynamics through investigations on piezometric surface and active groundwater recharge temporal evolutions; the development of qualitative hypothesis for seawater intrusion trends related to the possible evolution of climatic and non-climatic factors.

A short course on "Seawater intrusion monitoring" was held at Ardhi University in September 2013 addressed to 20 Master and PhD students.

The definition of the methodology to create scenarios on people's vulnerability to seawater intrusion and to identify priorities for adaptation has progressed during the reporting period. It combines the use of a forecasting approach for developing hypotheses regarding the potential future evolution of the seawater intrusion phenomenon with a participatory backcasting approach for defining adaptation objectives at the community level. Both approaches have been carried out in Temeke Municipality; in particular a community-based scenario exercise has been carried out in several peri-urban sub-wards in Kigamboni using the Forum Theatre techniques, to ensure people's participation in the goals formulation process.

All the results of the analysis conducted have been submitted to external evaluation by EU and EAC experts and presented for validation and discussion at the International Workshop "*Towards Scenarios for Urban Adaptation Planning-Assessing seawater intrusion under climate and land cover changes in Dar es Salaam, Tanzania*" held in Rome on April 2013. All the papers, presentations and video recording are published on the project website. The workshop proceedings are under development for publication.





The results from both scenario methodologies exercises are under elaboration.

3. Methodology for designing community based adaptation initiatives.

Some already consolidated approaches for mainstreaming have been identified and described in the review paper “*Mainstreaming Literature Review for the Design of a Mainstreaming Strategy*” published in the web site.

The guidelines for the assessment of LGAs’ plans and for integrating CC adaptation into those plans have been finalized. The results of their application to four existing plans will be discussed with LGAs during the next months. The results of this activity are strictly related with the work conducted with LGAs as described in WP3.

As regards the third project result (**WP3**) “Enhanced capacities of Dar's municipalities in understanding CC issues, designing adaptation activities and integrating them in their UDEM strategies and plans”, on one hand, two cycles of residential training have been held in Morogoro. They involved 38 officers from urban development and environment management units within DCC, the three Dar’s Municipalities (Kinondoni, Ilala and Temeke) and Ruvu Basin Authority. As follow up of the whole capacity-building an adaptation initiative has been designed by each LGA involved in the training. The proposals have been presented and discussed in the framework of the workshop “Towards Mainstreaming Climate Change Adaptation in Sustainable Development of Dar es Salaam City”, held in Dar es Salaam on September 2013.

A toolkit which collects the materials and systematizes the methodology of the whole training is under elaboration. It will aim to facilitate future improvement and replication of the capacity-building initiative.

On the other hand, four local plans, namely the Master Plan, the Temeke Municipal Council’s Strategic Plan, the Water Supply and Sanitation Plan and the Temeke Municipal Council’s Expenditure Framework, are at the moment under assessment by Sapienza and Ardhi. A number of initiatives for mainstreaming CC adaptation into those plans will be identified and discussed with LGAs during the next months.

**Dissemination** of the results achieved has been ensured through the elaboration of the working papers and their publication on the project web site: [www.planning4adaptation.eu](http://www.planning4adaptation.eu) in the section called “Dissemination”.

The project activities and its results have been disseminated by the project team during the reporting semester participating in the following national and international events, and presenting articles for publication:

- 4<sup>th</sup> Global Forum on Urban Resilience & Adaptation, Session “*Reality Check: Adaptation on the Ground Dar es Salaam, Tanzania*”, 31 May – 2 June 2013, Bonn, Germany.
- AESOP / ACSP 5th Joint Congress 2013 “Planning for Resilient Cities and Regions”: “*Adapting to Climate Change in Coastal Dar Es Salaam*” Macchi S., Ricci L., Congedo L., Faldi F; “*The Use of Backcasting Scenario for Planning Adaptation to Climate Change in Sub-Saharan Urban Areas*” Faldi G.; “*Using the Concept of Adaptive Capacity to Explore the “Urban Security” Approach in Kigamboni New City Project*” Ricci L.; 15-19 of July 2013,



University College Dublin, Ireland.

- LOCS 2013, The Local Climate Solutions for Africa 2013 Congress: “Settlements and Population located in Flood-prone Areas of Dar es Salaam: Local Challenges and Experiences with Adaptation and Risk Management” Rugai D, 31th October 2013, Dar es Salaam, Tanzania.
- International Conference “UICCA 2, Urban Impact of Climate Change in Africa. Planning with Scant Information”: “Adaptation to Climate Change in Dar es Salaam, Tanzania” Shemdoe R., “Mainstreaming Adaptation into Urban Development and Environmental Management Planning: Lessons from Dar es Salaam” Macchi S., “Analysis of the Sensitivity to Seawater Intrusion of Dar es Salaam’s Coastal Aquifer with Regard to Climate Change” Sappa G.; Posters: “Capacity Building for Adaptation to Climate Change at Local Government Level: the Case of Dar es Salaam” Fantini L., “Non climatic Factors of Vulnerability to Climate Change: an Estimation of Population in Dar es Salaam using Remote Sensing” Congedo L., “The Use of Backcasting Scenario for Planning Adaptation to Climate Change in Dar es Salaam” Faldi G., “Hydroclimatic Changes in Tanzania” Monti A. 13th of November 2013, Politecnico di Torino, Italy

EU visibility has been ensured during the activities implementation and for each of the above mentioned dissemination outputs following the rules of the “Communication and Visibility Manual for European Union External Actions” (EuropeAid, 2010)

#### **PROGRESS IN CROSS-CUTTING ISSUES:**

The action pays special attention mainly to three cross-cutting objectives: environmental protection, promotion of gender equality and equal opportunities and good governance.

- The whole action is based on the purpose of ensuring the **environmental sustainability** of adaptive measures and strategies. The target groups of the action are those living in coastal unplanned and underserved settlements (peri-urban areas) whose livelihood is strictly depending on natural resources. The protection of natural resources is one of the core elements of the “vulnerability” concept. The monitoring of coastal shallow watershed condition and the analysis of the current state of seawater intrusion phenomenon into Dar es Salaam’s coastal aquifer and its relationships with climatic conditions and urbanization processes provided a better understanding of the groundwater condition, that is a major issue for the target population’s vulnerability to CC.
- Women’s concern about CC impacts as well as **gender** aspects of adaptation have been taken into account as a fundamental piece of knowledge. Equal participation of men and women has been ensured in the Forum Theatre events, in the composition of the sample size in data collections and in the training activities. Furthermore women hold prominent positions in the action management.





- **LGAs' involvement** (mainly DCC and the three municipalities) in the project was ensured by the beginning of the project. Their availability, commitment and willingness to collaborate is essential to guarantee the effectiveness of the project results and the consistency with their strategies and the local institutional framework. During the training also the Rivu Basin Authority has been involved.

**ISSUES FACED/CORRECTIVE MEASURES:**

The involvement of the LGAs' officers from urban planning and environmental departments represented the main challenge of this phase of the project. Their participation during the two residential weeks of training was really active and successful. The high number of officers involved (38) caused some delays in the organization of the training weeks due to their availability..

**VALID COMMUNICATION PLAN:**

YES  NO

**ANNEX: RESULTS TRACKING TABLE**

## RESULTS-TRACKING TABLE

*Summarise state of progress since the start of the project towards delivering the action expected results.*

*Compare progress against plans, using log-frame indicators as appropriate.*

*State whether original OVIs are not applicable any longer and suggest most appropriate SMART indicators.*

Result Description	Result Indicator (OVI)	Target	Performance Rating (Red, Yellow, Green)	Progress/Arising Issues	Action Required by the which implementing partner/s
1.1 Livelihoods of population dependent on natural resources and their concern for CC investigated	N. households questionnaire administered/ Households questionnaire validated in the data entry	6000/5885	Traffic Light		
	N. people involved in the Data Analysis training course	26	Traffic Light		
	N. Data Analysis Methodologies implemented	3	Traffic Light		
1.2 Dar's institutional activities related to CC investigated	N. officers participating in the kick off meeting	10	Traffic Light		
	N. officers interviewed	48	Traffic Light		
1.3 Local options of autonomous adaptation and raise awareness on CC explored	N. people involved in the feasibility study	28	Traffic Light		
	Participatory cycles realized	2	Traffic Light		



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	N. people involved in the participatory cycles	At least 100 people for each cycle	Traffic Light	Almost 400 people involved in the first participatory cycle held in March 2012. Almost 500 people involved in the second cycle held in September 2012	
1.4 1st International Workshop organized	N. Background papers	2	Traffic Light		
	N. papers presented	4	Traffic Light		
	N. people attending the workshop	10 researchers from each university partner country (Tanzania and Italy); 3 seniors from EU universities; and 3 seniors from EAC/SADC universities	Traffic Light	4 senior researchers from EU universities and 2 from EAC/SADC universities	
2.1 Methodologies for monitoring changes in peri-urban settlements developed	N. methodologies developed for monitoring Land Cover changes	1	Traffic Light	2 (two similar methodologies, respectively for LANDSAT images and SPOT images)	
	N. LANDSAT images acquired/ N. LANDSAT classifications/ N. LANDSAT images processed	5 images acquired / 5 classifications/ 5 images processed (period 2002-2010)	Traffic Light	6 images acquired / 6 classifications/ 6 images processed (period 2002-2012)	
	N. Landscape Metrics Indices calculated for Land Cover change analysis	8	Traffic Light		



# ACC DAR Adapting to Climate Change in Coastal Dar es Salaam

	N. people involved in the training short course on land cover classification and landscape metrics analysis	20	Traffic Light	The short course has been held on “Seawater intrusion monitoring”	SAPIENZA
	N. methodologies developed for Land Cover validation	1	Traffic Light		
2.2 Methodologies for exploring CC vulnerability scenarios, as regards seawater intrusion phenomenon, developed	N. methodologies for conducting groundwater monitoring campaigns in Dar’s coastal plain/  N. georeferenced boreholes /  N. boreholes selected for the monitoring network	1 methodology/  133 georeferenced boreholes/  90 boreholes selected for the monitoring network	Traffic Light		
	N. groundwater monitoring activity conducted	1	Traffic Light	2 major monitoring campaigns/surveys (long term activity) have been carried out.  3 minor monitoring campaigns/surveys (monthly activity) have been carried out.	
	N. methodologies for the analysis of seawater intrusion /  N. maps produced	1 methodology /  9 maps (SWL maps, EC maps, Seawater intrusion maps for 1997, 2002, 2012)	Traffic Light	Sectors affected by seawater intrusion 2001-2012; Evolution of groundwater table 2003-2012; Evolution of EC, TDS and Cl values 2001-2005-2012; Groundwater Active Recharge evolution estimation 2002-2020; Groundwater exploitation evolution estimation 2002-2011	
	N. methodologies for exploring vulnerability scenarios under	1 methodology	Traffic Light		SAPIENZA & ARU



# ACC DAR Adapting to Climate Change in Coastal Dar es Salaam

	climate change /				
	Number of scenarios explored	3 scenarios explored		Working paper is under elaboration	
	N. methodologies for investigating Land Cover Change correlation with Climate Change	1	Traffic Light		
2.3 Methodology for designing community based adaptation initiatives developed	N. of methodologies for designing community based adaptation initiatives	1 methodology	Traffic Light	The methodology is defined, guidelines are developed.	SAPIENZA & ARU
	Toolkit for the design methodology	200 copies		The toolkit will be available on the web site	
2.4 2nd International Workshop organized	N. Background papers	2	Traffic Light	3	
	N. papers presented	4	Traffic Light	5	
	N. people attending the workshop	10 researchers from universities of each partner country (Tanzania and Italy); 3 seniors from EU universities; and 3 seniors from EAC/SADC universities	Traffic Light	24 persons in the indoor session on 20 <sup>th</sup> April 2013; Almost 100 persons in the opendoor session on 22 <sup>nd</sup> April 2013	
3.1 Capacity building strategy prepared	N. Need assessment report of the training needs of municipal staff	1 need assessment	Traffic Light		



## ACC DAR Adapting to Climate Change in Coastal Dar es Salaam

	N. Officers involved in the need assessment	At least 40	Traffic Light	50	
	N. capacity-building action plan	1	Traffic Light		
3.2 Training programme developed and implemented	N. learning curricula / N. evaluation procedures	2 learning curricula / 1 evaluation procedure	Traffic Light		ARU & SAPIENZA
	N. Training resource book	1	Traffic Light	A training toolkit is under elaboration	ARU & SAPIENZA
	N. Officers involved in the training	20	Traffic Light	38 officers participated during the first training week; 35 officers participated during the second training week	ARU & SAPIENZA
3.3 Mid term Conference organized	N. submitted papers	12	Traffic Light	5 adaptation proposals have been submitted by the LGAs	ARU & SAPIENZA
	N. People attending the Conference	100	Traffic Light	60	ARU & SAPIENZA
3.4 Dar's municipalities supported in designing adaptation initiatives	N. Adaptation initiatives designed	At least 4	Traffic Light	4 local plans has been selected and assessed. During the next semester recommendations for mainstreaming will be submitted	ARU & SAPIENZA
3.5 3rd International Workshop organized	N. Background papers	2	Traffic Light		SAPIENZA & ARU
	N. papers presented	4	Traffic Light		SAPIENZA & ARU
	N. Press release	At least 2	Traffic Light		ARU & SAPIENZA





# ACC DAR Adapting to Climate Change in Coastal Dar es Salaam

	N. people attending the workshop	10 researchers from universities of each partner country (Tanzania and Italy); 3 seniors from EU universities; and 3 seniors from EAC/SADC universities	Traffic Light		SAPIENZA & ARU
Dissemination results	N. scientific papers submitted to academic journals	At least 2 related to the result 1.1;  At least 1 related to the result 1.2;  At least 3 related to the result 2.1;  At least 3 related to the result 2.2	Traffic Light	1 published and 1 in press  1 in press  1 published and 2 in press  4 in press	SAPIENZA & ARU
	N. evaluation reports	6 (2 evaluation reports for each international workshop)	Traffic Light	2 evaluation reports already produced for the 1 <sup>st</sup> international workshop; 2 evaluation reports already produced for the 2 <sup>nd</sup> international workshop 2 evaluation reports will be prepared for the 3 <sup>rd</sup> international workshop	SAPIENZA & ARU
	N. Proceedings (international workshop and conference)	4 proceedings (1 for each international workshop and 1 for the international conference)	Traffic Light	Proceedings of the second international workshop are under preparation.	SAPIENZA & ARU



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	N. Booklets reporting on designed adaptation initiatives	500 copies	Traffic Light		SAPIENZA & ARU
	N. Posters on the identified adaptation initiative	100 copies	Traffic Light		SAPIENZA & ARU
	N. Web sites	1 web site with a public and a reserved area	Traffic Light	Updating of the contents during the whole project	SAPIENZA
	N. Promotional material kit	1 brochure + 1 bag + 1 CD Rom	Traffic Light	Pen-drive has been produced instead of CD Rom for both international workshops (in Rome and in Dar) Also t-shirt and posters have been produced for dissemination and visibility during participatory cycles	