



Grant Agreement Number: 724106

Project acronym: CAPITAL

Project full title: Collaborative cApacity Programme on Its Training-educAtion and Liaison

D. 3.3

Capacity Development Strategies for ITS Stakeholders

Due delivery date: 28.09.2018

Actual delivery date: 25.09.2018

Organization name of lead participant for this deliverable:

Project co-funded by the European Commission within Horizon 2020		
Dissemination level		
PU	Public	x
PP	Restricted to other programme participants (including the GSA)	
RE	Restricted to a group specified by the consortium (including the GSA)	
CO	Confidential , only for members of the consortium (including the GSA)	



This project has received funding from the European Union's Horizon 2020 research and innovation programme under the European Union's Horizon 2020 research and innovation programme under grant agreement No 724106

Document Control Sheet

Deliverable number:	3.3
Deliverable responsible:	CERTH
Work package:	3
Editor:	Panagiotis Iordanopoulos

Author(s) – in alphabetical order		
Name	Organisation	E-mail
Charis Chalkiadakis	CERTH	charcal@certh.gr
Malin Fanny	VTT	fanny.malin@vtt.fi
Panagiotis Iordanopoulos	CERTH	panior@certh.gr
Lina Konstantinopoulou	ERTICO	l.konstantinopoulou@mail.ertico.com
Risto Öörni	VTT	risto.oorni@vtt.fi
Panagiotis Pantazopoulos	ITS HELLAS	ppantaz@iccs.gr
Masha Tarle	IRU	masha.tarle@iruprojects.org

Document Revision History			
Version	Date	Modifications Introduced	
		Modification Reason	Modified by
V.1	05/04/2017	First draft including only literature review	Charis Chalkiadakis
V.2	05/09/2017	Second draft including methodological outline based on results from WP2	Charis Chalkiadakis, Panagiotis Iordanopoulos
V.3	06/10/2017	Input from VTT and ITS Hellas	Risto Öörni, Malin Fanny, Panagiotis Pantazopoulos
V.4	18/10/2017	Input from IRU	Masha Tarle
V.5	03/11/2017	Final Review from ERTICO	Lina Konstantinopoulou
V.6.	25/09/2018	Input from the workshops and the CAPITAL Online Training Platform	Charis Chalkiadakis

Abstract
<p>The aim of CAPITAL is to build a collaborative capacity community and deployment programme to support public and private stakeholders in the implementation of (C-)ITS with training and educational resources. One crucial element for the overall success of such a training programme is to define specific capacity development strategies based on the knowledge gaps and the training needs of the various relevant groups of trainees. This task defines capacity development strategies for stakeholders having substantial roles in ITS deployment. The current report includes the final capacity development strategies defined within CAPITAL project. The development of the strategies is based on the capacity and knowledge gaps identified by WP2, the information available from other tasks of WP3, results available in open literature (e.g. conference papers and presentations) and the knowledge and experience inside the consortium. The recommended capacity development strategies will be validated with a survey / stakeholder feedback after the training programmes. That is why this report will be published in 3 different versions for each of which new updated and modifications in the strategies will be included based on the feedback received by the trainees.</p> <p>This is the second version of the report, additionally to the first version, the first statistical results of the already conducted workshops and of the CAPITAL Online Training Platform.</p>



Legal Disclaimer

The information in this document is provided “as is”, and no guarantee or warranty is given that the information is fit for any particular purpose. The above referenced consortium members shall have no liability for damages of any kind including without limitation direct, special, indirect, or consequential damages that may result from the use of these materials subject to any liability which is mandatory due to applicable law. © 2016 by CAPITAL Consortium.



Abbreviations and Acronyms

Acronym	Definition
EC	European Commission
CAPITAL	Collaborative cApacity Programme on Its Training-educAtion and Liaison
ITS	Intelligent Transport Systems
C-ITS	Cooperative-ITS
CBA	Cost-Benefit Analysis
WP	Work package
f2f	Face-to-Face
R&D	Research and Development
PAR	Performance and Accountability Report
M&E	Monitoring and Evaluation
OEM	Original Equipment Manufacturer
CACC	Cooperative Adaptive Cruise Control
VMS	Variable Message Signs
5G	fifth-generation



Table of Contents

Executive Summary	7
1. Introduction	8
1.1 Purpose of Document	8
1.2 Intended audience.....	8
2. Overview of capacity development strategies	9
2.1 Definitions of capacity and capacity development	10
2.2 Main features of capacity-development frameworks	11
3. Methodological Framework.....	18
4. Users' needs and knowledge gaps	20
4.1 Literature review of ITS and C-ITS deployment barriers in Europe	20
4.2 Barriers derived from the survey of Deliverable 2.2.....	20
5. Capacity development strategies for ITS and C-ITS deployment	23
5.1 Capacity development Tools.....	27
5.1.1 Online courses	27
5.1.2 Webinars	29
5.1.3 Participation in face-to-face trainings.....	29
5.1.4 Workshops	30
5.1.5 Onsite visits	30
5.2 Tools targeted for Stakeholder groups.....	30
5.2.1 Strategies for 1st Know-How Level.....	32
5.2.2 Strategies for 2nd/3rd Know-How Level	33
6. Capacity development strategies monitoring.....	34
7. Acceptance of the proposed capacity development strategies	36
7.1 Turin	36
7.2 Lahti.....	38
7.3 Split	38
7.4 CAPITAL Online Training Platform	40
8. Discussion and Conclusions.....	41
References	42
Annexes	43



List of Figures

Figure 1 – Major challenges and difficulties that hinder deployment of ITS applications - reported by level 2 and level 3 stakeholders.....	24
Figure 2 – Main areas of interest for training (stakeholders on levels 1-3).....	24
Figure 3 – Main areas of interest (for training), stakeholders on knowledge levels 1-3	26
Figure 4 – Improvement of skills because of the training at the workshop	36
Figure 5 – Usefulness of the presented information	37
Figure 6 – Willingness to attend next CAPITAL training events	37
Figure 7 – Interest on training modes	38
Figure 8 – Knowledge of ITS, in general, before (left) and after (right) the workshop.....	38
Figure 9 – Knowledge of C-ITS, in general, before (left) and after (right) the workshop.....	39
Figure 10 – Training modes of interest for the participants	39
Figure 11 – Geography of registrants	40

List of Tables

Table 1– Definitions by major aid donors (direct quotes)	10
Table 2– Aspects of capacity development strategies among the three levels	16
Table 3 – Main training interest of the stakeholders	21
Table 4 – Main topics and subtopics for 1st, 2nd, and 3rd Know-How Level stakeholders	21
Table 5 – Additional Topics and Barriers and Challenges from 2nd / 3rd Know-How Level stakeholders	22
Table 6 – Type of Association and Main Training Topics and Regional Level and Main Training Topics	22
Table 7: Online Courses	28
Table 8: Planned Webinars.....	29
Table 9– Capacity development strategy for level 1 stakeholder	32
Table 10– Capacity development strategy for level 2 and level 3 stakeholders.....	33
Table 11: Program learning outcomes, indicators and Impact	35



Executive Summary

The aim of the CAPITAL (Collaborative cApacity Programme on Its Training-educAtion and Liaison) project is to design and deliver a collaborative capacity-building programme (comprising of training and further education) for practitioners in the public and private sector in the fields of Intelligent Transport Systems (ITS) and Cooperative-ITS (C-ITS) deployment. The European Commission (EC) has actively been supporting the development and deployment of C-ITS through its Sixth and Seventh Framework and now Horizon 2020 Work Programmes. CAPITAL is needed to exploit these R&D results and to help raising the awareness of the benefits of ITS and begin deployment. There is currently a gap between deployment and research & innovation. It is important that all those involved improve their skills and understanding of all aspects of ITS deployment.

This document, Deliverable 3.3: Capacity Development Strategies for ITS stakeholders, presents all those strategies through which the stakeholders working in the fields of ITS and C-ITS can strengthen their knowledge and abilities. There is a specific categorization of the stakeholders depending on their know-how level (1st, 2nd or 3rd level), on their area of responsibility in geographic terms (Local, National or International Level) and according to the type of the association (Public Authorities, Associations and ITS experts and Transport Operators).

This document specifically describes the general methodology for applying capacity development strategies and then it proposes those strategies that manage to tackle the fragmentations that exist and they are presented in the Deliverable 2.2.



1. Introduction

1.1 Purpose of Document

The main purpose of this deliverable, Deliverable 3.3: capacity development Strategies for ITS stakeholders is to define the necessary capacity development strategies in order for the Collaborative cApacity Programme on Its Training, educAtion and Liaison (CAPITAL) project to meet the needs and to bridge all the knowledge gaps of the Intelligent Transport Systems (ITS) stakeholders.

This document presents the capacity development strategies for all stakeholders, in order for them to expand their knowledge in the fields of ITS and Cooperative-ITS (C-ITS). The work starts by describing the general idea behind the capacity development strategies and all the necessary stages in order to plan those strategies. A revision of the knowledge gaps, as outlined in the Deliverable 2.2: Capacity Needs is presented followed by the description of the strategies according to the specific category a stakeholder is ranked. Finally all those means that lead to the assessment and monitoring of the proposed capacity development strategies is are described

1.2 Intended audience

The target audience of this document is all the spectrum of stakeholders that are related to ITS and C-ITS in general and to which CAPITAL project is addressed to. More specifically, the strategies are categorized in such a way in order to cover the needs of all the different stakeholders' groups as these have been identified in deliverables of work package 2 of CAPITAL project. Additionally, the feedback of the "beneficiaries" of CAPITAL project (participants in project workshops, trainees of the CAPITAL online tool etc.) will also be taken into account in order the final set of capacity development strategies to be consolidated, complete and subsequently as much effective as possible.

2. Overview of capacity development strategies

Capacity-building is a term widely used in relation to different organisations. A general definition states: capacity-building is 'planned development of (or increase in) knowledge, output rate, management, skills, and other capabilities of an organisation through acquisition, incentives, technology, and/or training' (<http://www.businessdictionary.com/definition/capacity-building.html>). The term has most often been used in relation to public institutions and has been widely debated and analysed from a conceptual point of view in development policy, which aims to improve the capacity of developing countries' institutions to deliver on their functions. The term 'capacity-building' appeared in the 1970s in the United States, in reference to the need to improve the capacity of state and local governments to implement fiscal decentralisation policies.

The term witnessed increased interest in the 1990s. The adverse economic conditions that many developing, particularly African countries, experienced in that period highlighted the lack of effectiveness of development efforts. These had failed to produce durable change and to strengthen the capacity of the recipient countries' institutions to take responsibility for development. The technical cooperation provided during the previous decades by international donors had often not made a lasting impact, failing to lead to self-reliance.

The 1993 UNDP report on Rethinking Technical Cooperation – Reforms for Capacity Building in Africa ('the Berg report') (<http://www.undp-forum.capacity.org/about/rethinking.htm>) was the first attempt to address these shortcomings systematically, building on what it described as a wide agreement on the reasons underlying technical cooperation failures. According to the report, such reasons included lack of local ownership and commitment caused by the donor-centric model of delivering technical cooperation, lack of incentives among poorly paid local staff, and rigid 'blue print' approaches based on predefined outputs that were failing to capture the real changes needed to produce a transformative effect.

In response to this, in 1998, the UNDP developed a framework of guidelines for capacity-building that identified three levels at which it has to take place, namely the individual, the organisation and the broader environment. Since the mid-1990s, all major multilateral and bilateral aid agencies and non-governmental development organisations have adopted capacity-building as a core element of their policies, and produced documents and handbooks on the subject.

The 1996 OECD report, Shaping the 21st Century: The Contribution of Development Cooperation (<https://www.oecd.org/dac/2508761.pdf>), marked a defining moment with its new development paradigm based on local ownership and partnership between donors and recipients. Spurred by such debates, there was also a shift to a new concept, that of 'capacity development', which became the preferred choice of the development community. These new trends were inspired by some major turning points in development policy, such as the adoption in 2000 of the UN Millennium Development Goals and the 2005 Paris Declaration on Aid Effectiveness (<http://www.un.org/millennium/declaration/ares552e.htm>), (<http://www.oecd.org/dac/effectiveness/34428351.pdf>). The latter highlights that capacity development is one of the essential preconditions for aid effectiveness: 'The capacity to

plan, manage, implement, and account for results of policies and programmes, is critical for achieving development objectives – from analysis and dialogue through implementation, monitoring and evaluation'. Capacity-building is the 'responsibility of partner countries', while donors play a supporting role.

The declaration also draws attention to the importance of the wider social, economic and political context. The document that best expressed the emerging consensus on the concept after years of debate in the development community was the 2006 OECD DAC (Development Assistance Committee) paper, *The Challenge of Capacity Development – Working towards Good Practice* (http://www.oecd-ilibrary.org/development/part-4-the-challenge-of-capacity-development_journal_dev-v8-art40-en). The definition therein of capacity and capacity development is the most widely accepted and used one. The same document clarified the difference between capacity-building and capacity development, expressing a clear preference for the latter. Capacity-building does not recognise existing capacity and operates with a pre-imposed design, while capacity development suggests an endogenous process of change.

2.1 Definitions of capacity and capacity development

Table 1– Definitions by major aid donors (direct quotes)

Organisation	Definition of capacity	Definition of capacity development
UNDP	The ability of individuals, institutions and societies to perform functions, solve problems, and set and achieve objectives in a sustainable manner.	<i>Capacity development</i> : The process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time. <i>Capacity-building</i> : A process that supports only the initial stages of building or creating capacities and assumes that there are no existing capacities to start from. (UNDP)
OECD DAC	'capacity' is understood as the ability of people, organisations and society as a whole to manage their affairs successfully. The definition is deliberately simple. It avoids any judgement on the objectives that people choose to pursue, or what should count as success in the management of their collective efforts.	<i>Capacity development</i> is understood as the process whereby people, organisations and society as a whole unleash, strengthen, create, adapt and maintain capacity over time. The phrase capacity development is used advisedly in preference to the traditional <i>capacity building</i> . The 'building' metaphor suggests a process starting with a plain surface and involving the step-by-step erection of a new structure, based on a preconceived design. Experience suggests that capacity is not successfully enhanced in this way.
World Bank	Capacity for development is the availability of resources and the efficiency and effectiveness with which societies deploy those resources to identify and pursue their development goals on a sustainable basis. (World Bank, 2009)	Capacity development (or capacity-building) is a locally driven process of learning by leaders, coalitions and other agents of change that brings about changes in socio-political, policy-related, and organisational factors to enhance local ownership for and the effectiveness and efficiency of efforts to achieve a development goal. (World Bank, 2009)
UNECA		Capacity development is the process through

Organisation	Definition of capacity	Definition of capacity development
		which individuals, groups and organisations, and societies deploy, adapt, strengthen, and maintain the capabilities to define, plan and achieve their own development objectives on an inclusive, participatory, and sustainable basis. (UNECA website)
USAID		Human and Institutional Capacity Development (HICD) is a USAID model of structured and integrated processes designed to identify root causes of performance gaps in host country partner institutions, address those gaps through a wide array of performance solutions in the context of all human performance factors, and enable cyclical processes of continuous performance improvement through the establishment of performance monitoring systems. (USAID , October 2010)
FAO	Takes over the OECD definition (FAO , 2015)	Takes over the OECD definition (FAO , 2015)
African Union		A process of enabling individuals, groups, organisations, institutions and societies to sustainably define, articulate, engage and actualise their vision or developmental goals building on their own resources and learning in the context of a pan-African paradigm. (Strategic Framework for Capacity Development in Africa)
EU	The European Commission takes over the OECD definition.	The European Commission takes over the OECD definition.

2.2 Main features of capacity-development frameworks

Capacity development is a broad and complex undertaking, implying change at multiple levels. The notion of change is central to many documents framing capacity-building/development concepts. It borrows from sociological ideas about the complex ways in which organisations are transformed, the multiplicity of factors affecting change, the fluid and dynamic character of the process and the importance of the affected individuals' and organisations' ownership and leadership. Despite this acknowledged complexity and fluidity of the required transformative processes, donor reports on capacity development attempt to provide technical step-by-step guidance, trying to capture the essence of transformative processes and the way they can be affected and influenced. Some donors also attempt to provide measurable results indicators. Despite the variations in the understanding of development capacity, there are certain common features for all conceptual frameworks.

- Local ownership of all interventions is considered crucial, and is one of the main elements distinguishing the new approach from traditional views on technical cooperation. Stakeholders in developing countries have to decide on the needs and

targets of capacity development; furthermore, they have to design the processes of change and assume leadership for them. According to the UNDP, an essential component of capacity development is 'transformation that is generated and sustained over time from within'.

- The need for partnerships between donors and local stakeholders follows directly from the importance of local ownership.
- Action is required at multiple levels to achieve sustainable results, because capacity development operates within an understanding of institutions as relying on individuals' skills and motivations, on one hand, and as embedded in a broader social and political context that shapes any transformative process, on the other.
- The change achieved has to be sustainable over time. According to the UNDP, capacity development starts from 'the principle that people are best empowered to realise their full potential when the means of development are sustainable – home-grown, long-term, and generated and managed collectively by those who stand to benefit'.
- Political and governance factors play an important role, given the influence they have on the functioning of institutions and on the possibility for reform. • It is important to engage civil society and the private sector in capacity development, both as drivers and as targets of capacity development.

There are a number of defining characteristics for capacity building however, all agree that:

- Capacity building is a process of change, it is about managing transformations.
- Capacity building is a long-term process, not a once-off intervention (but there can be short-term results)
- Capacity building is an internal (endogenous) process, meaning that change needs to be driven from within an individual and/or organisation to build a self-sustaining model.
- Capacity building involves all stakeholders (across organisations and hierarchy)
- Capacity building measures obstacles, progress and outcomes
- Capacity building goes beyond improving the human resource capacity to encompass the organizational and institutional contexts.

The objectives of capacity development are to (Canadian International Development Agency, 2000), (GEO Capacity Building Strategy. 2006):

1. Identify, coordinate and build synergies between existing and future efforts
2. Enhance, or more effectively utilize, skills, abilities and resources
3. Strengthen understandings and relationships, through access to data and information
4. Address issues of values, attitudes, motivations and conditions in order to support sustainable development

According to literature there are two approaches in the number of main levels of capacity building. The first approach sets four main levels of capacity building (<http://www.cadri.net/en/areaswork/capacitydevelopment>), (Canadian International Development Agency, 2000):



1. The Enabling Environment (the wider society within which individuals and organizations function)
2. Sectoral/Network
3. Organizational (the internal policies, systems and strategies that enable an organization to operate)
4. Individual (the skills and knowledge of individuals, communities and groups)

Each of these distinct but related perspectives represents a level of analysis, as well as a possible entry level for a capacity development intervention.

➤ **The Enabling Environment**

The Enabling Environment represents the broad context within which development processes take place. Experience suggests that this environment may in fact be either enabling or constraining, or possibly a mix of both. For example, poorly conceived policies, high levels of corruption, or lack of legitimacy can make for a highly 'disabling' environment with significant consequences for development initiatives. On the other hand, sound policies, high levels of commitment, effective coordination, and a stable economic environment can be important contributors to an enabling environment which can greatly increase prospects for success the enabling environment (Canadian International Development Agency, 2000).

Attempts to effect change at the enabling environment level generally take a considerable length of time given the nature of the issues being addressed - policies, structures, attitudes, values etc. While not all capacity development initiatives will seek to effect change in the enabling environment, they will need to be sensitive to factors at this level which may have an impact (positive or negative) on initiatives which are focused primarily on the organizational, sectoral or individual level (Canadian International Development Agency, 2000).

➤ **The Sector/Network Level**

Developing countries and donor agencies are increasingly focusing their investments on this level. This reflects an increasing awareness of the importance of coherent sector policies, strategies and programming frameworks, as well as effective coordination within and across sectors. Capacity development initiatives at this level may focus on policy reform, improvements in service delivery, or increased coordination among institutional actors. Investments may target the sector as a whole or a sub-sector, or alternatively focus on themes (e.g. poverty reduction), or area-based programming (Canadian International Development Agency, 2000).

Inclusion of networks in this level signifies the importance of collaboration within and across sectoral, thematic or other types of programs in any attempt to strengthen or more effectively utilize capacity (Canadian International Development Agency, 2000).

Change at this level can be challenging given allegiances to traditional ways of "doing business", competing organizational priorities, lack of coordination among related initiatives (e.g. sector reform programs and public sector renewal) or simply a lack of capacity. On the other hand, reforms at this level can contribute significantly to synergies and promote more effective use of existing capacities (Canadian International Development Agency, 2000).



However, in some other reports/references (<http://www.cadri.net/en/areaswork/capacitydevelopment>) this perspective is not mentioned, unlike the other three (individual, organizational, enabling environment) perspectives, and it is incorporated in the enabling environment perspective.

➤ **The Organizational Level**

This capacity level focuses on organizational structures, processes, resources and management issues. Traditionally, it has been the most common point of entry for bilateral donors. Typically donor-sponsored inputs have included technical assistance, budgetary or infrastructure support to individual organizations, or support for institutional linkages. An important dynamicity exists among the organizational, the sectoral and enabling environment levels, with performance of individual organizations being affected by a range of factors in each of those realms. Similarly, organizational performance depends on the availability, effective use and motivations of individuals (Canadian International Development Agency, 2000).

Capacity development encourages not only a thorough analysis of issues at the organizational level, but an assessment of how factors in these other levels may either constrain or support a process of organizational change. For example, an analysis by stakeholders may lead to the conclusion that attempts to strengthen local health bodies through training programs may not result in improved health delivery in the absence of adequate salaries for decentralized health workers. CD interventions at this level will usually seek to promote synergies among organizations and may be designed to contribute to change at the sectoral or enabling environment level, e.g. more effective integration of activities within the sector, and the promotion of new policies based on the innovative practices of individual organizations or networks (Canadian International Development Agency, 2000).

➤ **The Individual Level**

This level in the capacity development framework refers to individuals as social or organizational actors, e.g. small holder farmers, water engineers, planners, accountants – and the way their skills or abilities are harnessed or strengthened to contribute to the realization of development objectives. From a capacity development perspective, change at the individual level should be contemplated as part of a broader framework. Too often, development projects have focused narrowly on training of individuals without giving adequate attention to organizational issues, broader processes of empowerment or relevant factors in the Enabling Environment. Experience suggests that investments of this type risk being of limited benefit if these broader considerations are not taken into account in the design of the intervention (Canadian International Development Agency, 2000).

Programming decisions will be based on a host of variables including: the nature of the development problem being addressed, existing programs and capacities, current capacity strengths or gaps, and opportunities or inhibitors in the 'enabling environment'. In essence, the framework emphasizes the importance of understanding the problem in its full dimensions, systematic analysis of opportunities and constraints, identification of windows of opportunity and promotion of strategic and integrated responses (Canadian International



Development Agency, 2000).

According to the information above, in general setting the broad context for capacity development is critical. But when trying to design capacity development as a process, the management of human interactions in the form of actors and actions is the actual task through a dynamic stream of events throughout the various phases of a project such as initial planning and design, implementation and redesign. Some organizations, groups and individuals (e.g. ministries of finance) play a big role in the beginning and then drop out. Others (e.g. the peasant farmers and their husbands) may play a role of growing importance as the project proceeds. Donor representatives in various forms remain from beginning to end. When speaking about capacity development, special attention should be paid on how these different actors define and pursue their interests and how they respond to key events such as changes in government, natural disasters, economic trends and so on. There is a need a greater sense of the human dynamics - the strategic decision points, the chains of events and pursuit of self-interest and the collective good (Peter Morgan, 1998).

Most efforts at capacity development bump up against the tension between control and structure on the one hand and flexibility and experimentation on the other. Many participants are concerned about clear objectives, accountability, achievement of agreed results, transparency and predictability and the meeting of contractual requirements. Yet the process of capacity development is inherently unpredictable and un-programmable. It depends critically on constant learning and adaptation to be effective. Detailed planning fails virtually in all cases. Managing this tension becomes one of the main challenges involved in achieving effective results (Peter Morgan, 1998).

There are still experimental phases with different ways to judge the effectiveness of efforts, both internal and external, aimed at developing capacity. This deals with the topics of results-based management, monitoring and evaluation, indicators and so on. Two points seems obvious. First, monitoring, measuring and evaluating need to be more than a control mechanism designed mainly to satisfy donor accountability requirements. They need to be designed and managed so as to encourage learning, participation and commitment. This is difficult to be done given the fact that different actors - for example, donors, state agencies, executing agencies, beneficiaries – will tend to view capacity development and capacity from different perspectives (Peter Morgan, 1998).

Finally, participants need to have a capacity development frame of mind. Most project participants focus on program impact as the ultimate end. They see lower pollution levels or decreased rates of maternal mortality as the key and in some ways the only, objective of the project or program. They see their organizations as existing to do health improvement or economic analysis. Capacity development is treated as instrumental. Organizations must be efficient, effective and relevant. This perspective is entirely understandable and is commonly held by most professionals in all countries. Indeed, it is difficult to think of organizations or capacity in some form as not being a means to a greater program end (Peter Morgan, 1998).

The second approach comes from the United Nations Committee of Experts on Public Administration (United Nations Economic and Social Council, 2006). This approach sets three capacity building levels, which are described below:

1. Individual level: Capacity building on an individual level requires the development of conditions that allow individual participants to build and enhance knowledge and skills. It also calls for the establishment of conditions that will allow individuals to engage in the “*process of learning and adapting to change*”.
2. Institutional level: Community capacity building on an institutional level should involve aiding institutions in developing countries. It should not involve creating new institutions, rather modernizing existing institutions and supporting them in forming sound policies, organizational structures, and effective methods of management and revenue control.
3. Societal level: Community capacity building at the societal level should support the establishment of a more “*interactive public administration that learns equally from its actions and from feedback it receives from the population at large*”. Community capacity building must be used to develop public administrators that are responsive and accountable.

It must be emphasized that those three levels mentioned above are related to capacity building strategies of developing countries, which, however, are familiar with the general levels of capacity development strategies.

The information described above, about the levels of capacity development is presented in an integrated form in the table below (Table 1).

Table 2– Aspects of capacity development strategies among the three levels

	INDIVIDUAL LEVEL	ORGANIZATIONAL LEVEL	INSTITUTIONAL LEVEL
TECHNICAL COMPETENCE	Regularly updated knowledge and skills. Understanding of the broader technical context.	Appropriate knowledge and skills mixes for the services that are delivered, such as engineering, legal, financial etc. Knowledge on procurement and investment procedures.	Technical knowledge and available skill mixes in a broader setting. Procedures for critical review and collaboration of knowledge and information
MANAGEMENT COMPETENCE	Project Management skills. Financial Management skills. Personnel and team management skills. Mentoring skills. Understanding of political consensus building. Ability to deliver. Leadership.	Leaders able to operate with goals and objectives as agreed with supervisory entities and main stakeholders. Ability to set goals, strategy. Financial Management. People Management. Project Management. Ability to ‘deliver on-time’.	Sound and workable task assignments of sector agencies. Minimal overlap between agencies – size and task of agencies, facilitate proper management skills and task execution skills. Budgeting systems. Facilitate proper Management by organizations.

<p>GOVERNANCE COMPETENCE</p>	<p>Understanding of procedures. Ability to engage with and listen to stakeholders. Ability to apply inclusiveness. Focus on results.</p>	<p>Transparent decision making processes. Procedures to consult with stakeholders. Procedures to be held accountable, including transparency in budgets and plans.</p>	<p>Distinction between operator and regulator. Procedures to ensure inclusiveness in particular regarding objectives, priorities and strategies. Procedures to ensure transparency and accountability.</p>
<p>LEARNING COMPETENCE</p>	<p>Desire to keep learning, readiness to critically reflect on one's own performance. Availability for training and education in new skills and knowledge.</p>	<p>Readiness – procedures to critically review own performance on a continuous basis and revise (if necessary). Goals, procedures and resources to support, learning by staff, organization and stakeholders. Support of practice and reward of learning.</p>	<p>Procedures to promote open working atmosphere and critical reflectance on performance. Openness to review sector performance on a continuous basis and revise policies and arrangements. Foster inclusiveness.</p>

3. Methodological Framework

In the previous chapter a literature review about the aspects of capacity development building and capacity development strategies both in terms of levels (individual level, organizational level and institutional level) and competence (technical competence, management competence, governance competence and learning competence) was presented. In this chapter the prerequisite steps for the development of a capacity development strategy are presented.

According to literature (<http://www.cadri.net/en/areaswework/capacitydevelopment>), (JPO CAPACITY DEVELOPMENT WORKSHOP, 2006) the necessary steps, in order to develop a capacity development strategy, are:

- Step1:** Engage partners-stakeholders in capacity development.
- Step2:** Assess capacity assets and needs.
- Step3:** Define capacity development strategies.
- Step4:** Implement capacity development strategies.
- Step5:** Monitor and evaluate capacity development.

This process is iterative, considering that the results gathered from Step 5 can lead to changes at Step 1. The two first steps have been implemented in the previous deliverables of the CAPITAL project, through the engagement of partners/stakeholders and through surveys. This Deliverable deals with the Step3 of this process (definition of capacity development strategies). The developed strategies are related to the understanding of the current situation and the ability to use all the possible resources in order to improve the situation. In general, those strategies are (JPO CAPACITY DEVELOPMENT WORKSHOP, 2006):

1. Capacity diagnostics: Needs and capacity assessments, measurement and monitoring, advisory services, local Research and Development (R&D)
2. Knowledge services and learning: Large group training, technical and tertiary education, on-the job skills transfer, focus groups
3. Leadership development: One-on-one coaching, mentoring, management skills development
4. Institutional reform and change management: Results-based management, performance management systems, functional reviews, Performance and Accountability Report (PAR) in transitions, procurement services
5. Multi-stakeholder engagement processes: Process facilitation, institutional twinning, e-networks, community dialogue spaces, integrated planning and problem analysis...
6. Mutual accountability mechanisms: Monitoring and Evaluation (M&E) processes, social watch, peer and partner reviews
7. Incentive systems: Salary supplements, non-monetary benefits, pay and compensation

Another important factor is the characteristics of the capacity development strategies. First of all they take a systemic approach to the capacity assets and needs of a project. They also require the engagement of multiple stakeholders, often across sectors, for integrated development and they seed and support longer-term endogenous processes, and hence entail a mapping and understanding of endogenous capacities. Finally they guide and



systemically strengthen specific skill sets in a results-based management approach (be it in a local and national setting) and they facilitate information and knowledge sharing in the public domain, particularly to facilitate innovation and engagement on the political economy (JPO CAPACITY DEVELOPMENT WORKSHOP, 2006).

4. Users' needs and knowledge gaps

4.1 Literature review of ITS and C-ITS deployment barriers in Europe

The barriers referred to ITS and C-ITS deployment across Europe still exist today causing delay of the development and the deployment of such technologies and solutions. One of the main problems is economic and it has to do with the delay between the investment and the benefit from the deployed ITS or C-ITS technology. In average, Original Equipment Manufacturers (OEMs) must invest for at least 5-10 years before customers can benefit from the deployed applications (K. Sjöberg et. al, 2017).

Another critical factor is the penetration rate. Even if all vehicles were fully equipped with the latest technology and applications, it would take some years before a reasonable market penetration is reached. Also, in order for certain C-ITS applications to function properly, they need higher penetration rates than others (K. Sjöberg et. al, 2017). Penetration rates would not be such critical factors if smart infrastructure was already in place to support drivers. Applications such as Cooperative Adaptive Cruise Control (CACC) and platooning are more dedicated to traffic efficiency and transport of goods and may more quickly find their way into the market than those with pure safety-related features. So, customers would see an immediate benefit if applications which run on smart infrastructure, such as Variable Message Signs (VMS) and road-work warnings, were in place (K. Sjöberg et. al, 2017). Last but not least, ITS and C-ITS deployment faces challenges by other unforeseen and unpredictable sources of concern. The Wi-Fi industry wants to share the allocated frequency band of 5.9 GHz. That change of frequency can cause problems in the communication between the installed systems and technologies. Also, ITS and C-ITS deployment is further blurred by all efforts and money currently allocated to fifth-generation (5G) development (K. Sjöberg et. al, 2017).

4.2 Barriers derived from the survey of Deliverable 2.2

Deliverable 2.2 of work package 2 categorizes the stakeholders firstly based on their Know-How Level in 3 different levels (1st, 2nd or 3rd level), secondly based on their area of influence (Local, National or International Level) and according to the type of the association (Public Authorities, Associations and ITS experts and Transport Operators).

Below there is a brief presentation of the distinction on the Know-How Levels as mentioned in the Deliverable 2.2:

- 1st Level - ITS start-up communities with no or very limited know-how on the deployment of ITS.
- 2nd Level - advanced and intermediary communities that already gained some experience or familiarity with different ITS systems or already deployed ITS applications/services in their sphere of influence.
- 3rd Level - highly experienced communities that have extensive experience in research and deployment of ITS technologies.

The main interests of the stakeholders, for all Know-How Levels of the stakeholders, are:

- Best Practices
- Evaluation methods and Cost-Benefit Analysis (CBA) of ITS Services
- Relevant technologies and standards

Also, only for the 1st Know-How Level stakeholders, there is a need for a general introduction. This information is presented in the table (Table 2) below.

Table 3 – Main training interest of the stakeholders

Main training interests
Best-practice cases
Evaluation methods and cost-benefit analysis of ITS services
Relevant technologies and standards
General Introduction (for 1 st Know-How Level stakeholders)

The main priority topics which concern the stakeholders, of all Know-How Levels, are:

- Access and Management of Data
- Emerging Services – C-ITS
- Passenger Transport Services
- Traffic Management and Network Control
- Traveller Information Services

Despite that, there are some certain subtopics which concern certain Know-How Levels. More specific, the 1st Know-How Level stakeholders rank as first subtopic the “Event Detection and Transport Data Collection” and the “Traffic Control in Urban Areas”, as second subtopic the “Access to Dynamic Transport Data” and as third subtopic the “C-ITS in Urban Areas”. 2nd and 3rd Know-How Level stakeholders rank as first subtopic the “Event Detection and Transport Data Collection” and the “Traffic Control in Urban Areas”, as second subtopic the “Safety and Security for Passenger Transport” and as third subtopic the “Multimodal Journey Planning”.

Table 4 – Main topics and subtopics for 1st, 2nd, and 3rd Know-How Level stakeholders

Know-How Level	Main Priority Topics and Highest Priority Subtopics				
	Access and Management of Data	Emerging Services - C-ITS	Passenger Transport Services	Traffic Management and Network Control	Traveller Information Services
1st	1 st Rank: Event Detection and Transport Data Collection			1 st Rank: Traffic Control in Urban Areas	
	2 nd Rank: Access to Dynamic Transport Data				

		3 rd Rank: C-ITS in Urban Areas			
2nd / 3rd	1 st Rank: Event Detection and Transport Data Collection			1 st Rank: Traffic Control in Urban Areas	
			2 nd Rank: Safety and Security for Passenger Transport		
					3 rd Rank: Multimodal Journey Planning

Another important feedback is the list with the additional topics and the list with the barriers and challenges, as stated by the 2nd and 3rd Know-How Level stakeholders.

Table 5 – Additional Topics and Barriers and Challenges from 2nd / 3rd Know-How Level stakeholders

Additional Topics	Barriers and Challenges
Connected and autonomous vehicles or connected autonomous driving, incl. truck platooning	Unclear costs and benefits of ITS services, also including a lack of awareness on the benefits of ITS systems in general
Road Safety	Lack of cooperation and coordination in the ITS sector, also caused by the factor of the complexity of the multi-stakeholder involvement
Electromobility	Missing or unclear business models for ITS
User acceptance	Need for financial resources for the implementation of ITS

There is also information about the preferred Main Training Topics both in relation to the type of the association and to the association's regional level. The outcomes of the survey are represented in the table (Table 5) below.

Table 6 – Type of Association and Main Training Topics and Regional Level and Main Training Topics

Type of Association and Main Training Topics	Regional Level and Main Training Topics
Financing and funding opportunities (Public Authorities)	Financing and funding opportunities (Local Level)
Workshops organized by public authorities (Associations and ITS experts, Transport Operators)	Workshop organized by public authorities (Local Level, National Level)

5. Capacity development strategies for ITS and C-ITS deployment

Developing a capacity development strategy provides answers to few important questions: what information should be disseminated or shared, for whom it should be provided, how it is expected to improve the capabilities of the target group and what are the most suitable means for achieving the objectives. Stakeholders on levels 2 and 3 already have experiences with deployment of ITS or C-ITS. They can therefore be expected to be familiar with the basics of ITS and C-ITS such as the most common technical solutions available. Because of having at least basic experience with ITS deployment, they have at least basic understanding of the process how new innovations are introduced in their field and in their own organisations. This means that level 2 and level 3 stakeholders will have no training needs related to introduction to ITS and C-ITS.

It makes sense to start the development of the capacity development strategy from the barriers for ITS deployment reported by level 2 and level 3 stakeholders and the topics on which they are interested to receive training. Some of the barriers are in fact also knowledge gaps. Major challenges and difficulties that hinder the deployment of ITS reported by level 2 and level 3 stakeholders have been summarised in Figure 1. Figure 2 summarises the main areas of interest for training reported by level 1-3 stakeholders. Two of the three most significant challenges reported by level 2 and 3 stakeholders (Figure 1) (the costs and benefits of such a system are not known and the best organisational structure/business model for such a system is not clear) can be understood as gaps in existing knowledge. The third most significant barrier (there is a lack of resources to finance further implementation) can possibly be affected by increasing awareness of the existing funding mechanisms available for ITS deployment, but it may also represent the funding constraints (market based or legal and budgeting issues) faced by organisations with the potential for deployment of ITS.

About a quarter of level 2 and level 3 respondents also indicated that politicians do not see ITS (or the ITS system) as a goal at the moment (28%), the procurement process is too complex or an adequate model for procurement is missing (29%) or the knowledge related to technical implementation is not available (27%). The first of the challenges can be addressed only indirectly by a capacity building program like CAPITAL. The complexity of the procurement process and lack of suitable procurement model can be addressed by providing best practice cases of the application in question and information on the most common business models related to the system.

Figure 1 – Major challenges and difficulties that hinder deployment of ITS applications - reported by level 2 and level 3 stakeholders

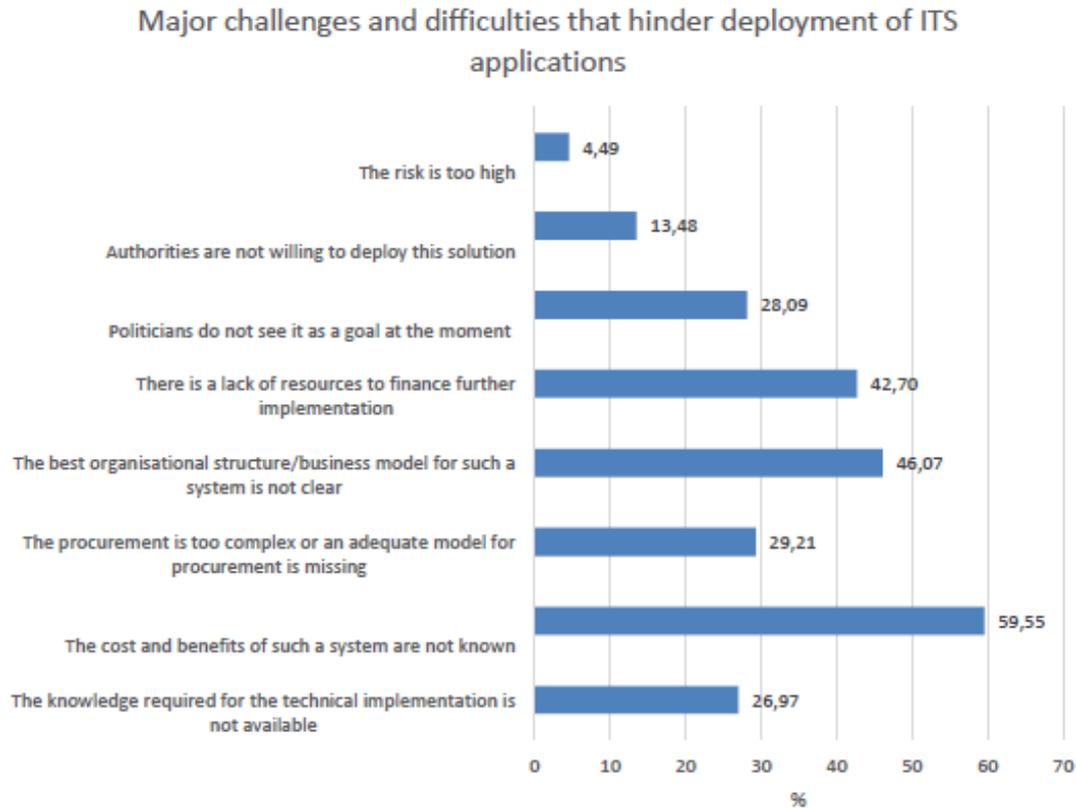
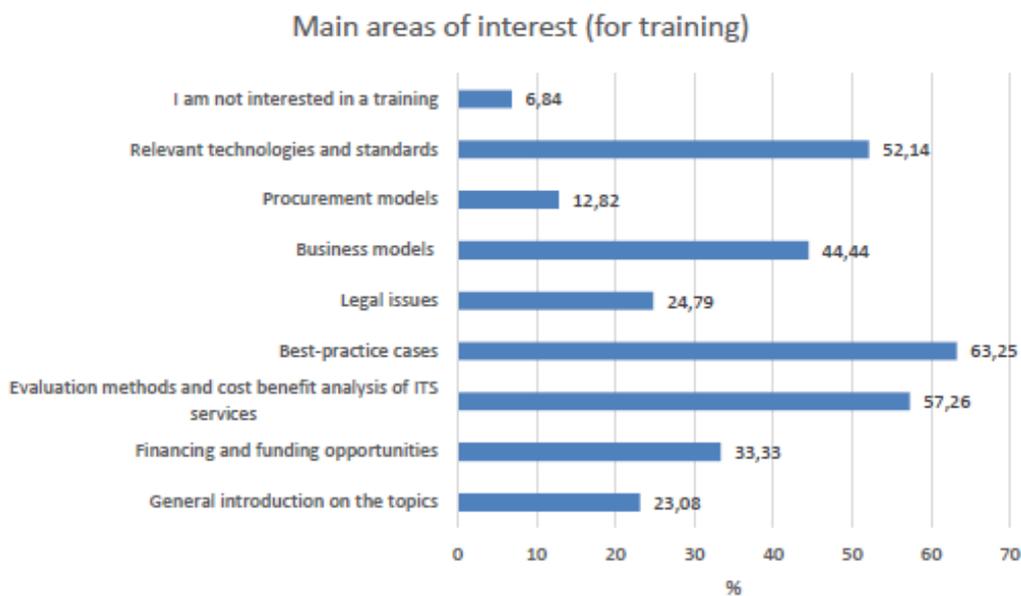


Figure 2 – Main areas of interest for training (stakeholders on levels 1-3)



The lack of information on technical implementation - even at level 3 - can be explained by a variety of factors. First, many of the C-ITS systems are still in the stage of piloting, as indicated by the results of the Drive-C2X and other related projects. While the functionality of



the systems has been widely disseminated and development work has been carried out in several European projects, information on the technical implementation of the systems is usually available only in project deliverables available to a restricted group (e.g. the consortium involved in the project). While information provided in the standards of ITS and C-ITS systems describes the functionalities and the core technical solutions, it does not include all the information required for successful implementation and is often fragmented. Stakeholders' knowledge on matters regarding technical implementation can therefore be improved by providing tutorials, courses and other materials and training. In conclusion, knowledge related to technical implementation on ITS and C-ITS should be provided especially to stakeholders on level 3.

It would be preferable to focus the trainings on technical implementation on systems which are relevant in the context of CAPITAL and for which a greater need for information can be expected than other systems. In practice, this means systems that are both novel and have high complexity by their nature. Several statistically significant relationships were found to exist between stakeholder's knowledge level and the preferred topics for training. 44% of the 3rd level respondents indicated the missing knowledge required for the technical implementation as an important barrier, whereas only 16% of the 2nd level respondents considered this as important barrier. 62% of 3rd level respondents perceived lack of a clear business model or the best organisational model as an important barrier, in comparison to only 36% of the 2nd level respondents.

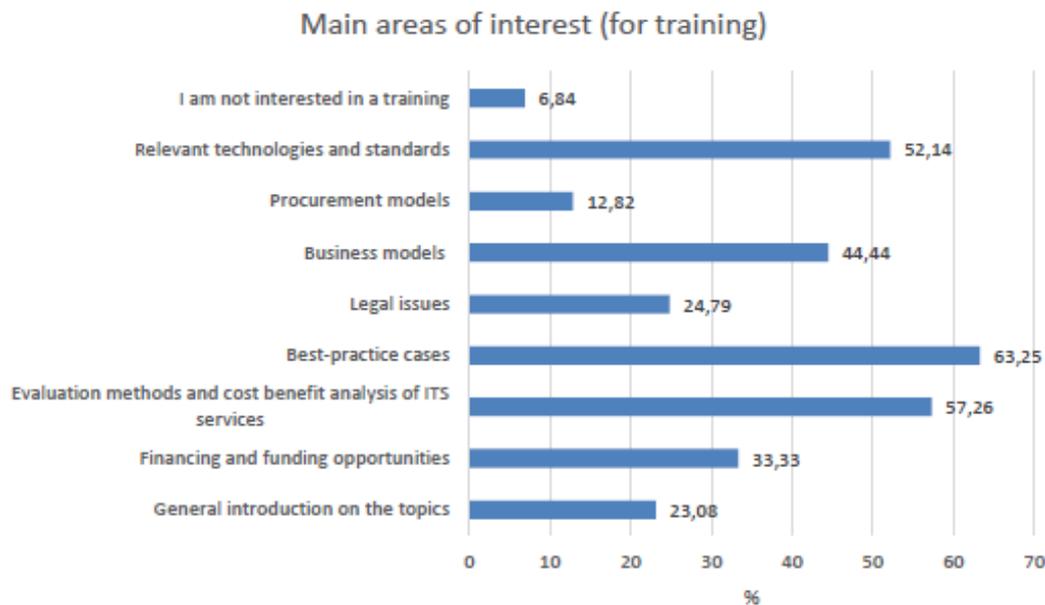
The results of the questionnaire indicated also that level 3 stakeholders considered the lack of clear business model or best organisational model more frequently as a barrier than level 2 stakeholders. It is somewhat open for discussion, how much the lack of clear business model or the best organisational model can be affected by a capacity building programme like CAPITAL. Difficulties with establishing a business model for C-ITS stem partly from the long period between investment and benefits experienced by customers (Sjöberg et al. 2017), from the chicken and egg problem which can be explained by game theory and the risk that any investment may be quickly made obsolete by rapid progress of technology. The first of the challenges is related to the nature of C-ITS, the second is an incentive problem rather than a problem related to lack of information. The third of the challenges is related to the way new computing and data communication technologies are developed and evolve. While the best available information on the topic will most likely make decision-makers better equipped to make choices, it may be too optimistic to expect, it will solve all those challenges.

Training on the business models and organisational structures should make experts and decision-makers aware of the challenges and their solutions identified so far, enable them to formulate with words the challenges they have experiences by themselves, provide solutions to the most common problems and present a few case studies where the problems have been successfully solved. Especially trainings on organisation and business models of C-ITS services should include an interactive component, as the participants may also have their own experiences to share on the topic. The results of the questionnaire analysed in CAPITAL work package (WP) 2 suggest that certain stakeholders may be more willing to participate in a workshop organised by public authorities or industry stakeholders. This may be related to the fact that public authorities are perceived as an impartial source of

information while the industry usually has the latest information development of technical solutions available. The training activities to be proposed in the capacity development strategy should take into account the main areas of interest for training and the priority topics for ITS deployment expressed by stakeholders on knowledge levels 2 and 3.

The main areas of interest for training expressed by stakeholders on levels 1-3 have been documented in CAPITAL Deliverable 2.2 (Figure 3).

Figure 3 – Main areas of interest (for training), stakeholders on knowledge levels 1-3



It is very likely that general introduction to ITS or C-ITS will not be of major interest for level 2 and level 3 stakeholders. It can therefore be omitted when planning a capacity development strategy for level 2 and level 3 stakeholders. Based on the results in Figure 3, six main areas for training are proposed for level 2 and level 3 stakeholders:

- Impacts, evaluation methods and cost-benefit analysis
- Relevant technologies and standards
- Business models
- Financing and funding opportunities
- Procurement and legal issues
- Best practice cases.

Stakeholders on knowledge levels 2 and 3 were also asked, what the priority topics for ITS deployment are. Topics related to transport data such as event detection and transport data collection (48%), aggregation and management of transport data (38%), access to dynamic transport data (39%) and access to static transport data (31%) were mentioned by relatively many respondents as priority topics. About 40% of respondents also indicated multimodal journey planning (40%), safety and security of passenger transport (40%) C-ITS on high level road network (39%), integrated traffic management (38%) and traffic control on high level road network (37%) as priority topics for ITS deployment. The training methods should be selected based on the information to be provided with the training and the expected level



of interaction with participants. Webinars are suitable for one-way dissemination of information for small or large audiences, but the potential for interaction between the organiser and participants and between participants is much more restricted than in case of workshops, seminars or roundtable conversations. Other training tools such as workshops, roundtable conversations and seminars are better suited for trainings that require interaction between participants, e.g. sharing of best practice cases and discussing the experiences obtained. The capacity development strategy proposed for level 2 and level 3 stakeholders is described in the table below (Table 5).

5.1 Capacity development Tools

The capacity development strategies proposed in this section have the goal to bridge all the knowledge gaps existing, as they described above. The training tools presented below are in full compliance with the preferred training tools, as stated in the Deliverable 2.2, and they are common for all Know-How Level stakeholders.

The capacity development strategies needed for the training of the CAPITAL project main target groups are in full compliance with all the levels of capacity development, as they described in the Table 1. So, it is fully understandable that the strategies described below guarantee the proper training of all target groups and the meet of all the knowledge gaps as they arise from the survey conducted. The capacity development strategies, as they described below, try to fulfil the needs of the main target groups by providing them with all the necessary information and all the required benefits, always in correlation with the Know-How Level, the type of the association and the regional level of each stakeholder. These strategies have to do with the understanding of the main topics from the stakeholders and the ability to use all the resources provided in order for them to be fully educated about ITS and C-ITS. There is a separation in the strategies followed for 1st Know-How Level and 2nd/3rd Know-How Level stakeholders.

The use of advanced on-board technologies and cooperative systems is becoming very important in commercial vehicles both for passenger and freight transport. Therefore, capacity development on these topics is urgent. Each stakeholder group however has different needs and interests, which all call for a tailored strategy approach. Here we will outline the approach to undertake so that diverse stakeholders needs are taken into account.

In terms of capacity development tools, we would propose the following tool:

1. Participation to online courses
2. Participation to webinars to very specific topics
3. Face to face Trainings/ Onsite practical visit will also be available during the face to face trainings.
4. Workshops
5. Onsite and practical visits

5.1.1 Online courses

The online training platform is used purely for development of the trainee and trainer

handbook and hosting of the online courses, meanwhile the project website serves as the backbone for all communication activities and gathers all information about the CAPITAL, platform, facts and figures as well as news, press releases, events and consortium data. More information on the topic studies are under WP3. The online will be offered in January 2018 till the end of the project and they will be available for a limited period of 1 month maximum (with available online support) to be able to ensure completion. The same courses could also be possible to be offered self-paced. More information can be found in D5.3. The online courses that will be offered through the platform are:

Table 7: Online Courses

#	Topic study	Topic description
ITS-1	Introduction to ITS and C-ITS	<ul style="list-style-type: none"> - Definitions of ITS and C-ITS terminology and abbreviations (by relevant organisations such as ETSI, iMobility Forum, PIARC) - Who are the stakeholders? - How is the C-ITS solution different from the ITS I already have? - Who benefits from ITS and C-ITS? - Types of benefits - Impact assessment (basic) - Understanding the C-ITS policy framework - Understanding the H2020 and CEF frameworks and some examples of research and development projects in ITS and C-ITS - How will C-ITS help me to deliver my policies?
ITS-2	Communication technologies for ITS and C-ITS including relevant standards	<ul style="list-style-type: none"> - FRAME architecture for ITS and C-ITS - ITS Technologies - Systems engineering - ITS standards and how to apply them - Interoperability, testing and certification - Engagement with HMI point of view in ITS
ITS-3	TMC and roadside technologies for ITS	<p>Level 1:</p> <ul style="list-style-type: none"> - Traffic control in urban areas - Access to dynamic transport data - Integrated traffic management - C-ITS in urban areas <p>Level 2:</p> <ul style="list-style-type: none"> - Event detection and transport data collection - Safety and security of passenger transport - Multimodal journey planning <p>Level 3</p> <ul style="list-style-type: none"> - Event detection and transport data collection - C-ITS on high level road network - Aggregation and management of transport data - Access to dynamic transport data
ITS-4	ITS and C-ITS user services	<ul style="list-style-type: none"> - ITS and C-ITS services for professional drivers - ITS and C-ITS cooperation among professional drivers and public authorities - ITS and C-ITS services for normal drivers and user acceptance - communicating ITS to the public
ITS-5	Impact assessment of ITS and impacts of selected ITS and C-ITS systems	<ul style="list-style-type: none"> - Impact assessment of ITS - Data collection for impact assessment - Evaluation methodologies - Impacts of ITS and C-ITS services

ITS-6	Financial incentives, business models and procurement models for C-ITS deployment	<ul style="list-style-type: none"> - Business model frameworks - Stakeholder perspectives on business models - Governance schemes and data exchange - Engagement of public and private stakeholders
ITS-7	Cost-benefit analyses of ITS services	<ul style="list-style-type: none"> - How will we determine costs and benefits of C-ITS? - How will services be financed? - How much will it cost to install, operate and maintain? - How can C-ITS build on existing investments?
ITS-8	Guidance in Deploying ITS (C-ITS), including policy frameworks, deployment and implementation strategies, roadmaps and international best practices	<ul style="list-style-type: none"> - Service implementation characteristics of employed hardware and software (C-ITS) - Information on the local stakeholders and their role during operation and continuous engagement - Best practices from projects and pilots and lessons learnt
ITS-9	Information security, data protection and privacy (optional)	<ul style="list-style-type: none"> - Information security in the context of C-ITS - User privacy, ITS and big data - Liability in case of a technology failure leading to an accident

5.1.2 Webinars

Webinar is a cost-effective dissemination mean which is used by the project for raising awareness and for providing capacity building/ training of ITS/C-ITS. Webinars will be organised following different needs at different stages of the project and upon request:

Table 8: Planned Webinars

Webinar	Planned date	Main topics	Target group
webinar for 1st Know-How Level	February 2018	1st Know-How Level on Webinar on Standards and gap analysis	Public Authorities
webinar for 2nd/3rd Know-How Level	June 2018	2nd/3rd Know-How Level on TMC	public authorities
webinar for 2nd/3rd Know-How Level	December 2018	2nd/3rd Know-How Level	End users/ Industry
1st webinar for 1st Know-How Level	February 2019	1st Know-How Level Webinar on Standards and gap analysis	Public Authorities
2nd webinar for 2nd/3rd Know-How Level	June 2019	2nd/3rd Know-How Level	public authorities
3rd webinar for 2nd/3rd Know-How Level	September 2019	2nd/3rd Know-How Level	End users/ Industry

5.1.3 Participation in face-to-face trainings

- M13: Italy – Mediterranean cluster – Demo – 1° Generation ITS Guidance (TTS Italia) – Turin – October 2017 - Ongoing
- M17: Finland – Nordic cluster – 2° Generation ITS Guidance (VTT) – Contacts with universities + combined events with Balkans in February 2018

- M21: Austria – Central Eastern cluster – 1° Generation ITS Guidance (Austriatech) – CROCODILE II event- summer 2018- Croatia
- M25: UK – West European cluster - 2°/3° Generation ITS Guidance –Train the trainee programme (Newrail) – 1/8 October 2018 – NewCastle – C-ITS implementation
- M29: Greece – Balkans cluster + Turkey - Demo - 1°/2° Generation ITS Guidance (CERTH + ITS Hellas) – Athens (M26) or Thessaloniki (M29) – to be decided after Turin results
- M33: The Netherlands – Western European cluster (Luxembourg + Belgium + The Netherlands + Germany) – Demo - 2°/3° Generation ITS Guidance (Helmond) – 4/7 June 2019 – Helmond – ITS Congress
- M35: Brussels – 3° Generation ITS Guidance – Train the trainee programme – Event with DGMove + all clusters involved
- Mediterranean cluster – Spain + Portugal - 1° Generation ITS Guidance – Bilbao (C-Mobile project) – 23 November 2017 – TBC

5.1.4 Workshops

Workshops and roundtables that address a concrete question, and bring around the table sector/technology experts and good practice examples of solutions to the challenges posed. Within the project duration, synergies with the ERTICO TM 2.0 platform are going to be enhanced to organize specific workshops on TMC and roadside technologies for C-ITS for all levels of stakeholders and Best Practices for Sharing of experiences with ITS and C-ITS deployment.

5.1.5 Onsite visits

Meet and greet”: organizing tours for stakeholders at ITS events, where they can meet technology providers and be introduced to the new technologies available. In addition, - “EU projects showcase” - bringing European funded projects dealing directly or indirectly with ITS to the stakeholders, either in form of live demonstrations or Q&A sessions.

5.2 Tools targeted for Stakeholder groups

➤ Thematic approach

Capacity development strategies can be thematically divided into three categories. For each of these categories we can already identify EU-funded projects which can showcase existing future technologies and thus become a central element of the capacity development strategy. Considering the thematic and functional aspect of ITS, capacity development can be focused on:

- a) Systems that increase road safety (projects such as I_HeERO, Safer LC)
- b) Systems to reduce pollution (projects: LEARN, Transformers) and
- c) Systems to optimise operations (projects: MyCorridor, AEOLIX, C-Mobile)

➤ **Associations and ITS experts**

This group is presumably already quite knowledgeable in ITS, however some knowledge gaps will still exist. Most importantly, this group needs to stay updated on the latest technology solutions and trends. They need a capacity development of all three thematic categories explained. In terms of tools they would greatly benefit from workshops and roundtables that address concrete questions, so they can expand their knowledge and capacity. They will also benefit from meeting and greeting technology providers directly. In many cases they will already be involved in EU funded projects and can therefore also help with content for the third tool mentioned above. Capacity development of ITS experts should also focus on improving their capacity in view of their training others on the importance of ITS tools (train the trainers).

➤ **Transport operators, fleet managers and drivers**

This group is much closer to the needs on the ground for ITS. It has already been established, in a document titled "IRU factsheet on the use of ADAS", that there is a gap between the use of ADAS systems and the learning and training packages available for drivers and operators and how to use them effectively. There are a number of ADAS identified in the mentioned document and which are very concrete e.g. Curve Speed warning (CSW) or Road Sign recognition (RSR) just to mention some. On all these topics training can be delivered either online or face-to-face. This group would therefore benefit most from concrete trainings. Transport operators would further develop their capacity through the tools "Meet and greet" of technology providers and EU project showcases such as the I_HeERO Demo Tour on eCall mechanism, organised by IRU Projects in October 2017. In addition there is a need to harmonise training provided by vehicle manufacturers. Different original Equipment Manufacturers (OEMs) provide training on systems available on new vehicles: what functionalities are available, how they can be activated and how they should be used. Training is often customised to the brand and does not provide a general overview of the technologies making it not applicable to other brands vehicles. When operators buy a vehicle from a different OEM they need a specific training on how to use the same technologies.

➤ **Local and national level (authorities)**

These stakeholders will have specific needs for capacity development that span all three themes and the first three tools that are listed. These stakeholders will greatly benefit from being introduced to a variety of topics (pre-defined by them) such as Transport data aggregation and management, multimodal journey planning, Cooperative ITS and real time traffic information, amongst others. Their local and national challenges need to be taken into account as a starting point. The preferred tool for this stakeholder would be the workshop and roundtables addressing specific issues and bringing experts and good practices around the table.

5.2.1 Strategies for 1st Know-How Level

Table 9– Capacity development strategy for level 1 stakeholder

Information (“What”)	Training methods (“How”)	Learning Outcome
Introduction to ITS and C-ITS	online courses	<p>Increased knowledge of</p> <ul style="list-style-type: none"> - Definitions of ITS and C-ITS terminology and abbreviations (by relevant organisations such as ETSI, iMobility Forum, PIARC) - Who are the stakeholders? - How is the C-ITS solution different from the ITS I already have? - Who benefits from ITS and C-ITS? - Types of benefits - Impact assessment (basic) - Understanding the C-ITS policy framework - Understanding the H2020 and CEF frameworks and some examples of research and development projects in ITS and C-ITS - How will C-ITS help me to deliver my policies?
Relevant technologies and standards	Online courses	Increased knowledge on the existing technical solutions for ITS and C-ITS
	Webinar on Standards and gap analysis	Sharing of experiences with implementation of novel ITS and C-ITS systems and validation of standards for ITS and C-ITS
TMC and roadside technologies for C-ITS “Traffic control in urban areas”, “Access to dynamic transport data”, “Integrated Traffic Management” and “C-ITS in urban areas”.	Online courses	Generic knowledge on the existing specific technical solutions for TMC and roadside technologies for C-ITS
	Workshops on specific topics linked to TM 2.0 platform	<p>Increased knowledge on the existing specific technical solutions for traffic control and demand management in urban areas</p> <p>Formulated policy/ strategy, Enhanced skills, Fostered communities</p>
ITS and C-ITS user services (optional)	Online courses	<p>Generic knowledge ITS and C-ITS services for professional drivers</p> <p>ITS and C-ITS cooperation among professional drivers and public authorities</p> <p>ITS and C-ITS services for normal drivers and user acceptance</p>
	Webinar (organised by public authorities and industry)	knowledge of ITS and C-ITS services related to exchanging of data of public authority and industry – with basic services
Evaluating and Impacts of ITS and C-ITS services	Online courses	knowledge of Impact assessment of ITS, Evaluation methodologies & Impacts of ITS and C-ITS services

5.2.2 Strategies for 2nd/3rd Know-How Level

Table 10– Capacity development strategy for level 2 and level 3 stakeholders

Information (“What”)	Training methods (“How”)	Learning Outcome
TMC and roadside technologies for C-ITS “Event Detection and Transport Data Collection”, “Safety and Security for Passenger Transport” and “Multimodal Journey Planning”.	Online courses	Generic knowledge on the existing specific technical solutions for TMC and roadside technologies for C-ITS
	Workshops on specific topics linked to TM 2.0 platform	Increased knowledge on the existing specific technical solutions for traffic control and demand management in urban areas Formulated policy/ strategy
TMC and roadside technologies for C-ITS “Event Detection and Transport Data Collection”, as well as “C-ITS on high level road network”, “Aggregation and Management of Transport Data” or “Access to Dynamic Transport Data”.	Online courses	Generic knowledge on the existing specific technical solutions for TMC and roadside technologies for C-ITS
	Workshops on specific topics linked to TM 2.0 platform	Increased knowledge on the existing specific technical solutions for traffic control and demand management in urban areas Formulated policy/ strategy, Enhanced skills, Fostered communities
Impacts and evaluation of ITS and C-ITS	Online courses	Increased knowledge on the impacts of ITS and C-ITS, evaluation methods and sources of information on the impacts of the systems
Relevant technologies and standards	Online courses	Increased knowledge on the existing technical solutions for ITS and C-ITS
	Webinar on Standards and gap analysis	Sharing of experiences with implementation of novel ITS and C-ITS systems and validation of standards for ITS and C-ITS Enhanced skills
Business models	Online courses	Increased knowledge on the typical business models of ITS and C-ITS systems covered by CAPITAL, the requirements of the business
	D2.3 Deployment Transferability handbook	Sharing of experiences with business models for ITS and especially C-ITS Enhanced skills, Fostered communities
Financing and funding opportunities	Online course	Familiarity with the most common ways to finance and secure funding for implementation of an ITS system and the basics of different funding mechanisms Enhanced skills
	Workshops (organised by public authorities)	Facilitation of collaboration between relevant actors and making them better prepared to take advantage of the financing and funding opportunities for implementation of ITS and C-ITS

		Formulated policy/ strategy, Fostered communities
Procurement and legal issues	Online courses (legal issues to be handled as a part of the course “implementation issues”, a dedicated course on procurement methods?)	Familiarity with the procurement models available for ITS and C-ITS. Increased knowledge on the legal issues related to deployment of ITS and C-ITS systems and their implications for related contracts and regulation of the systems. Formulated policy/ strategy, Enhanced skills, Fostered communities
Best practice cases	Online course Onsite practical visit training workshops (organised by public authorities) Workshops linked to TM 2.0 platform D2.3 Deployment Transferability handbook	Sharing of experiences with ITS and C-ITS deployment, especially best practice cases. Potential aspects to be covered include technical implementation and technical functioning of the system, impacts of the system, suitability of business models, financing of the system and experiences with funding mechanisms and possible experiences obtained in the procurement process. Formulated policy/ strategy, Enhanced skills, Fostered communities

6. Capacity development strategies monitoring

For monitoring purposes, a learning activity is considered as an action taken or work performed by which inputs are converted into specific outputs. Learning activities, such as providing training, conducting a workshop, etc. are designed to deliver outputs that allow achieving learning objectives. Inputs are the financial, human, and other resources mobilized to support activities undertaken by a capacity development program. Input indicators would measure the quantity (and sometimes the quality) of resources provided for program activities. In a context of a capacity development program, these can include: Funding (counterpart funds, co-financing, grants), Human resources (number of person-years for client/partner agencies, consultants, and technical advisers) and Equipment, materials, and supplies, or recurrent costs of these items—for example, textbooks, classroom facilities. Outputs are the products and services resulting from a learning activity that is designed to generate learning outcomes. The key distinction between outputs (specific goods or services) and learning outcomes is that an output typically takes the form of an increase in supply of knowledge and information, while learning outcomes reflect behavioural changes resulting from the use and application of acquired knowledge and information. Output indicators would measure the quantity (and sometimes the quality) of the goods or services created or provided through the use of inputs. Using a capacity development program as an illustration, these might include the number of people trained, the number of new courses offered, and the number of new consultations conducted. As defined in the table below, the six learning outcomes lie at the heart of the change theory posited for any capacity development effort and form the basic building blocks of the associated change process. For each capacity development intervention, the set of learning outcomes and their sequence is tailored to the capacity factors that are to be improved (socio-political environment, policy instruments, or organizational arrangements), to the agents of change who are to make those improvements, and to the envisioned change process.

Table 11: Program learning outcomes, indicators and Impact

Capacity development strategy	Learning outcomes	Generic results indicator	Specific Results indicator	Measures of indicators
Online Courses	Improved ITS awareness	Participant understanding of ITS issues or improvement of an ITS deployment situation	Fulfilment of online courses (quizzes, case studies, etc.)	60 local authorities engaged, 28 member states involved, 30 commercial operators 5 trainers per member state.
Participation to webinars	Enhanced skills	New skills/knowledge acquired and applied	General questionnaires and quizzes after each webinar	60 local authorities engaged, 28 member states involved, 30 commercial operators 5 trainers per member state.
Face to face Trainings	Identification of gaps and user needs	Improved consensus/teamwork, Informal network(s) created/expanded Formal partnerships or coalitions created/expanded	General questionnaires	A minimum of 30 attendants (15 public authorities and 15 commercial operators) per training workshop
On-site practical visit	Improved ITS awareness from real life implementations	Formulated policy/ strategy New skills/knowledge acquired and applied Exchange of know-how	General questionnaires	A minimum of 10 attendants (5 public authorities and 5 commercial operators) per visit

7. Acceptance of the proposed capacity development strategies

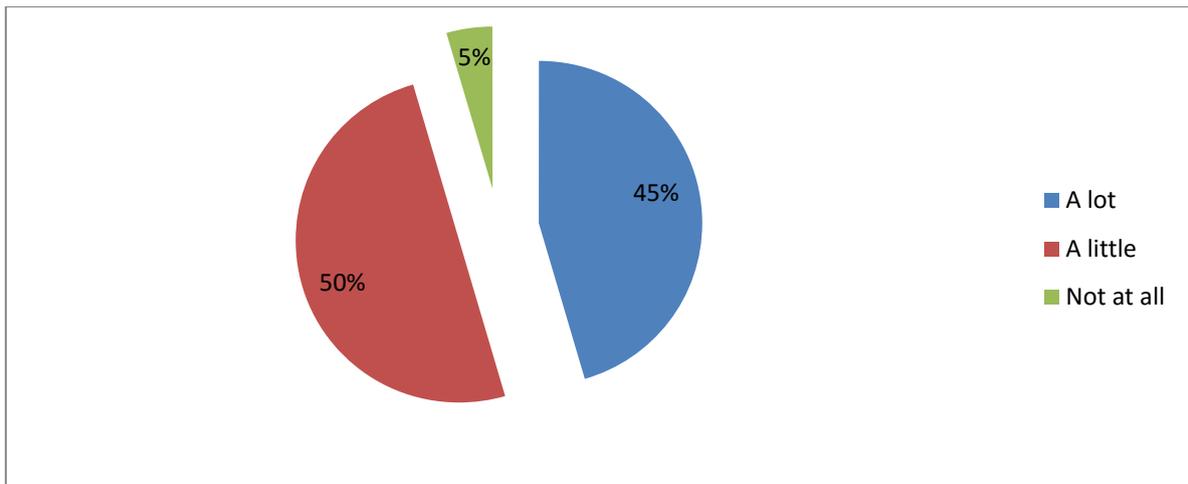
The provided results are referred to the workshops of CAPITAL Project in Turin, Lahti and Split. The preliminary statistical analysis regarding the CAPITAL Online Training Platform is also provided. For the next version(s) of this Deliverable, more information will be provided regarding both the conducted workshops and the CAPITAL Online Training Platform.

In the next subchapters only the capacity development strategies' acceptance-related feedback is provided. A more extensive statistical analysis of the provided feedback is presented in the Deliverable 4.3.

7.1 Turin

The below charts present the feedback of the CAPITAL Turin workshop with a total number of 22 participants. It is proved from the charts that the capacity development strategies proposed in the current Deliverable are effective, because the skills of the participants have been improved after the workshop.

Figure 4 – Improvement of skills because of the training at the workshop



It is also obvious in the below pie charts that the participants considered the presented information useful and the majority of the participants state their willingness to participate in future CAPITAL training events.

Figure 5 – Usefulness of the presented information

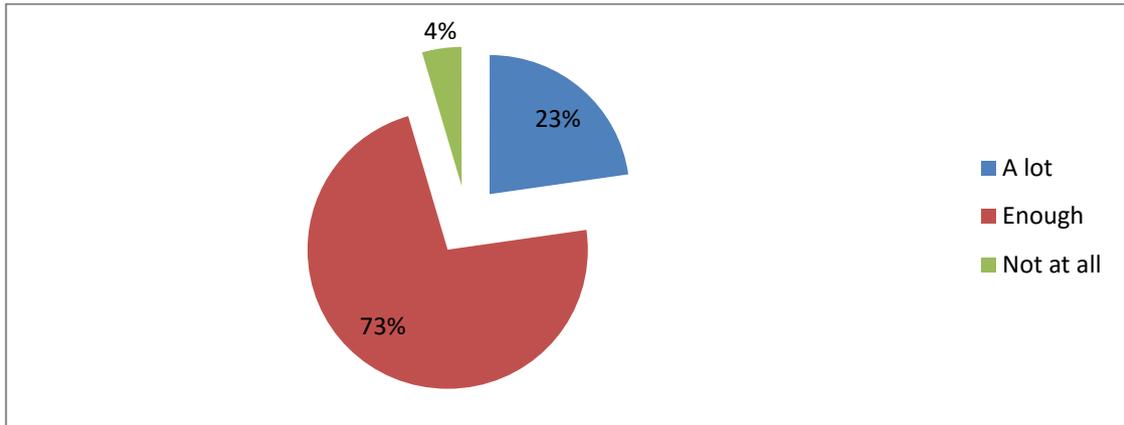
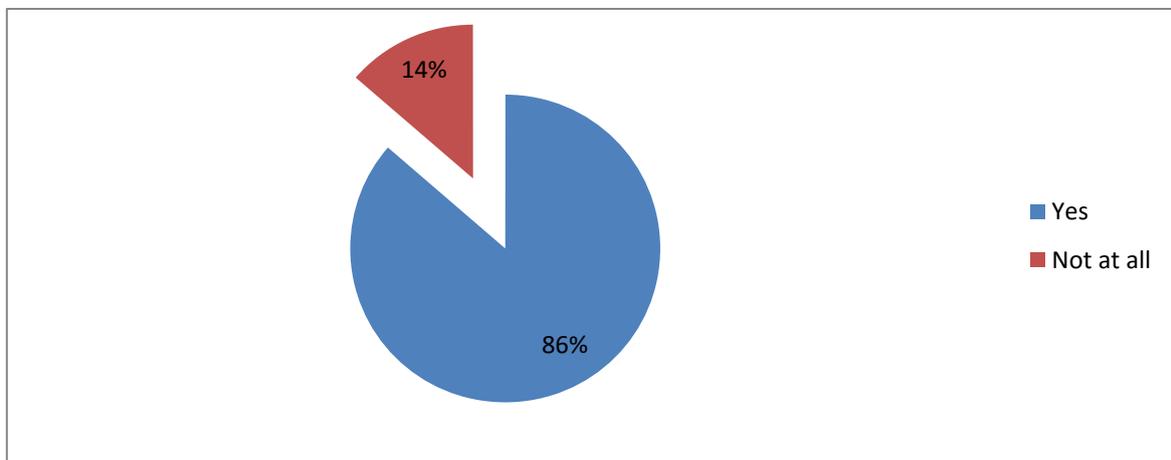
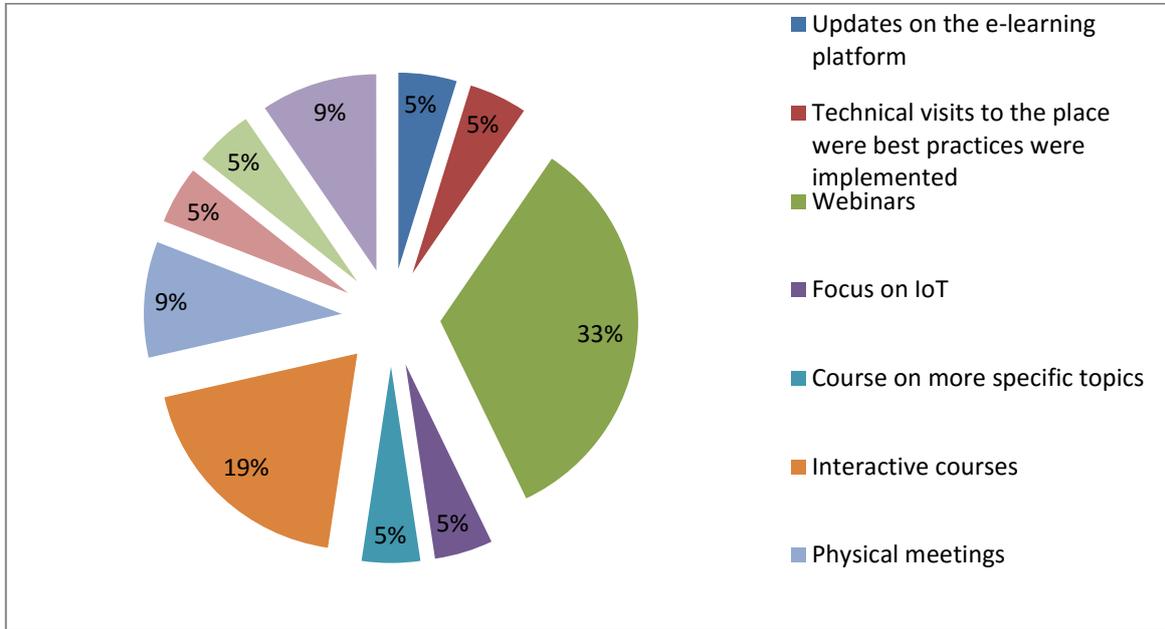


Figure 6 – Willingness to attend next CAPITAL training events



However, the respondents proposed some training modes which are expected to improve the usefulness and the acceptance of the CAPITAL Online Training Platform. The proposed training modes should be considered as a valuable addition in the platform.

Figure 7 – Interest on training modes



7.2 Lahti

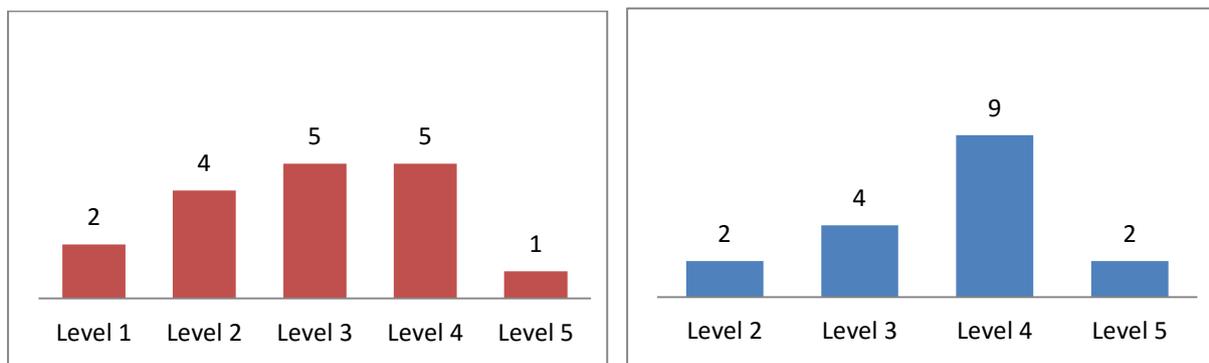
No statistically significant data is available, due to the fact that only 3 replies were available regarding the questionnaires of Lahti workshop.

7.3 Split

At the CAPITAL workshop at Split a feedback form containing a total of 18 questions was provided to the participants, with the aim of optimizing the training programs offered within CAPITAL.

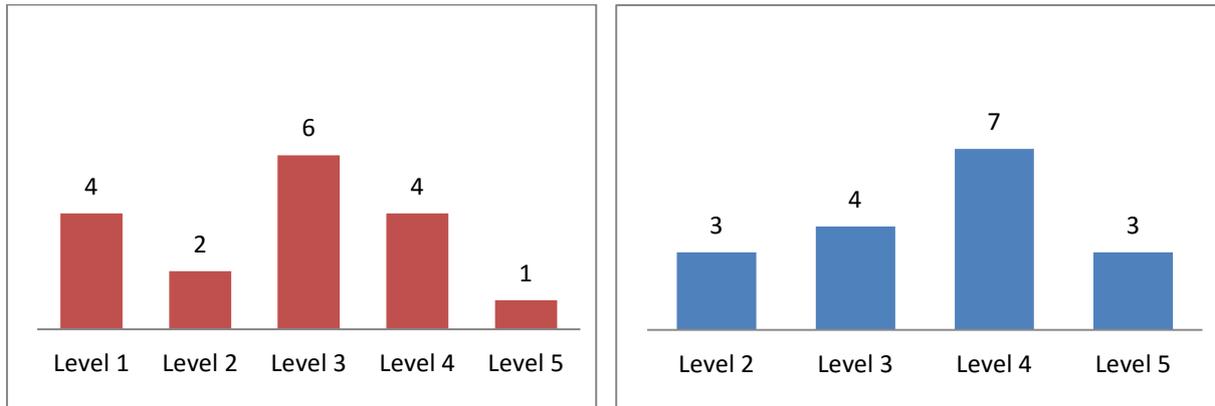
The following diagrams provide information regarding knowledge of ITS and C-ITS before and after the event. It is evident from the below charts that the provided information, as based in the capacity development strategies, assists at increasing the knowledge of the participants towards ITS and C-ITS.

Figure 8 – Knowledge of ITS, in general, before (left) and after (right) the workshop



(Level 1 = Beginner to Level 5 = Expert)

Figure 9 – Knowledge of C-ITS, in general, before (left) and after (right) the workshop

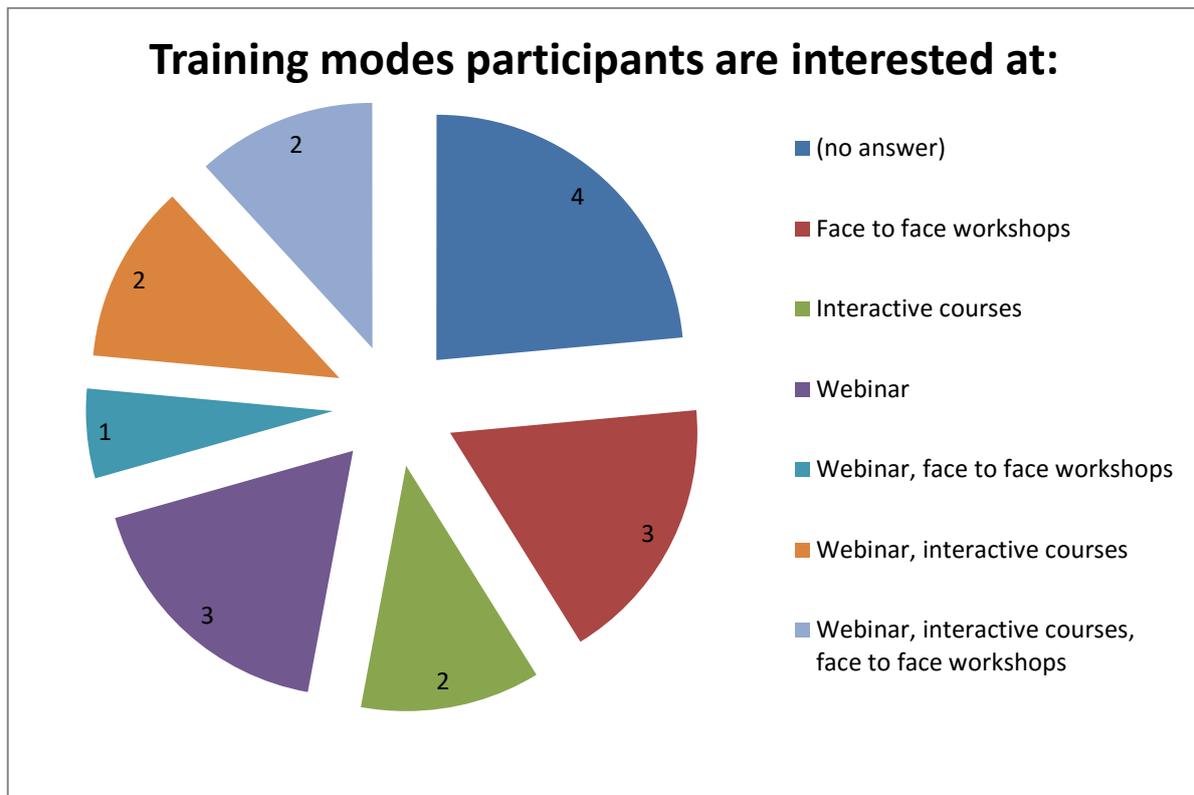


(Level 1 = Beginner to Level 5 = Expert)

Furthermore, all of the respondents said that they would like to attend future CAPITAL workshops and/ or training events.

The diagram below shows which training modes would be interesting for the participants of the workshop (those who answered the questionnaire).

Figure 10 – Training modes of interest for the participants



Finally, when asked for further options regarding the workshop (Do you have any additional comments or suggestions? What did you like most? What didn't you like at all? What should we consider for further events/trainings?), one of the respondents answered: *“multi-facetted character of training; e.g. starting from traffic management expertise, ending with GIS expertise and programming”*.

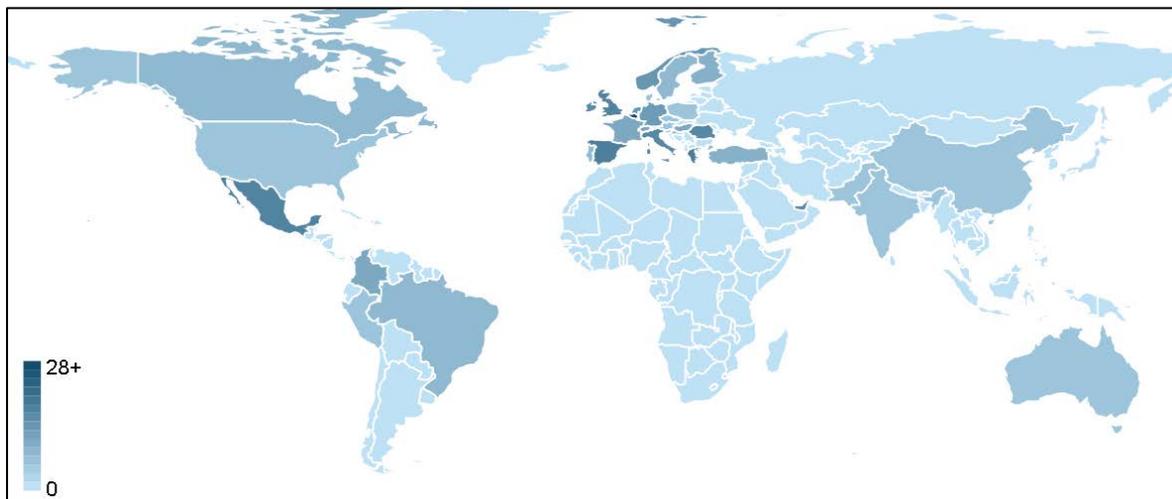
7.4 CAPITAL Online Training Platform

The most significant data feedback regarding the success of the selected capacity development strategies will be provided from the CAPITAL Online Training Platform. A trial analytics tool has been activated for the CAPITAL Online Training Platform, which allows access to data on usage and performance. In the near future, validated feedback from the CAPITAL Online Training Platform will be integrated and presented in future versions of the current Deliverable. Nevertheless, the below paragraphs present some preliminary user data statistics. It is a general overview of the users already registered to the platform.

The only currently derived information which can indicate the correctness of the chosen capacity development strategies is the number of participants in the CAPITAL Online Training Platform courses. At the time of reporting there were 688 enrolments for one or more courses on the CAPITAL Online Training Platform.

Figure 11 shows the geography of the different registrants and indicates so far on how well the program has been internationally outreached.

Figure 11 – Geography of registrants



The figure illustrates an internationally exploited usage of the e-learning platform. In total there are 36 regions or countries represented among the nationalities of the respondents. The top country of enrolment is Belgium (12 percent), presumably due to the placement of ERTICO. On second place are both Greece and Spain, with 7 percent each of total enrolments. However, the results also show that the concept has reached out to countries like Mexico, Colombia and the United Arab Emirates and thereby follow the objective of an international outreach programme.

8. Discussion and Conclusions

Based on the results, as retrieved from Deliverable 2.2, there is a general assumption that there are some fundamental knowledge gaps in the fields of ITS and C-ITS, as referred to all-know-how-levels stakeholders. Those fragmentations lead to delays in the development and dissemination of the new ITS and C-ITS technologies. In order to tackle those fragmentations, some capacity development strategies are proposed in Deliverable 3.3.

There is a variety of strategies applied worldwide. In each case, and based on each case's special needs and requirements, different techniques are applied. The strategies proposed in Deliverable 3.3 try to bridge all the existing fragmentations in the ITS and C-ITS dissemination process, by providing all the necessary elements and knowledge to the stakeholders.

The proposed capacity development strategies are categorised based on the Know-How level of the stakeholders (1st, 2nd and 3rd level) and on the type of the organization (public authorities and ITS stakeholders). There are also different strategies applied according to the area of responsibility, in geographic terms, of each public authority and/or stakeholder (local and national level authorities). All the proposed capacity development strategies have been chosen based on literature review and on the statements of the stakeholders who took part in the survey as presented in Deliverable 2.2.

The first feedback provided both from the first 3 conducted workshops and from the CAPITAL Online Training Platform indicate that the chosen capacity development strategies for the presentation and the whole structure of the courses provided in the CAPITAL Online Training Platform manage to assist the participants in broaden their knowledge upon ITS and C-ITS. However the participants, mainly through their responses in the workshops' evaluation questionnaires, indicated the need for the enrichment of the CAPITAL Online Training Platform with a number of additions which will assist the smooth operation of the platform.

The next version(s) of this Deliverable will incorporate more feedback both from the CAPITAL Online Training Platform and from the expected workshops. At this point of time the chosen capacity development strategies will be re-examined in order to meet the expectations of the participants/ users of the CAPITAL Online Training Platform.



References

CADRI (<http://www.cadri.net/en/areaswework/capacitydevelopment>), as retrieved 5/4/2017

Capacity Development: Why, What and How., Canadian International Development Agency, Vol. 1, No. 1, May 2000

Capacity and Capacity Development - Some Strategies, Note prepared for the Political and Social Policies Division, Peter Morgan CIDA Consultant, October 1998

GEO Capacity Building Strategy, November 2006

JPO CAPACITY DEVELOPMENT WORKSHOP, TBLIS, GEORGIA, 25-29 SEPTEMBER 2006

Definition of basic concepts and terminologies in governance and public administration, United Nations Economic and Social Council, 5 January 2006

Katrin Sjöberg, Peter Andres, Teodor Buburuzan and Achim Brakemeier (2017), Cooperative Intelligent Transport Systems in Europe. Current Deployment Status and Outlook, IEEE Vehicular Technology Magazine Vol. 12. Issue 2, pp. 89-97., DOI: 10.1109/MVT.2017.2670018

Brown L., LaFond A. and Macintyre K. (2001) Measuring Capacity Building, University of North Carolina

Alaerts G., Blair T. and Hartvelt F. (ed) (1991), A Strategy for Water Sector Capacity Building, Proceedings of the UNDP Symposium, Delft, Netherlands

United Nations Development Programme (1998) Capacity assessment and development; United Nations Development Programme: <http://www.cbd.int/doc/pa/tools/Capacity%20assessment%20and%20development.pdf>

Brown R., Mouritz M. and Taylor A. (2006) 'Chapter 5: Institutional Capacity', in T Wong (ed.), Australian Runoff Quality: A Guide to Water Sensitive Urban Design, Engineers Media, Crows Nest, NSW, pp. 5/1-5/20

<http://www.businessdictionary.com/definition/capacity-building.html>

<http://www.undp-forum.capacity.org/about/rethinking.htm>

<https://www.oecd.org/dac/2508761.pdf>

<http://www.un.org/millennium/declaration/ares552e.htm>

<http://www.oecd.org/dac/effectiveness/34428351.pdf>



Annexes

Annex to Resolution 4.6/2 (EC-64)

WMO Capacity Development Strategy

1. Introduction

The need for WMO capacity development assistance is grounded on the Convention of the World Meteorological Organization (WMO) which recognizes that Members need to work with each other and with other organizations to coordinate, standardize, improve and encourage efficiencies in the exchange of information to further their application to the needs of society. The Convention further notes the vital mission of National Meteorological and Hydrological Services (NMHSs) in the provision of weather, climate and water observations and services, and their contributions to addressing societal needs. WMO implements its Programmes through the NMHSs of its Members and utilizes the capabilities of NMHSs to provide effective services for the safety and well-being of society. The scope of services provided by NMHSs has increased as the need for environmental information has grown. Increasing vulnerability of many societies to natural hazards and extreme weather events, and sensitivity of national economies to climate variability and change have exposed gaps in the existing capabilities of NMHSs, particularly those of developing countries, Least Developed Countries (LDCs) and Small Island Developing States (SIDS). The Sixteenth World Meteorological Congress considered that the collaborative work of WMO depends on observations and technical contributions from developing and developed country NMHSs alike, and therefore assisting the NMHSs in developing countries to fill these gaps is necessary to the work of WMO, and benefits all WMO Members.

Cg-XVI adopted the WMO Strategic Plan which recognizes “capacity building for the developing and least developed countries” as one of the five strategic priority areas expected to make a significant contribution to the achievement of the Expected Results”. To further elaborate how capacity building as a cross-cutting priority will be addressed and in light of the factors discussed above, Cg-XVI adopted Resolution 49 (Cg-XVI) - calling for a WMO Capacity Development Strategy (CDS).

The purpose of the CDS is to provide a coordinated and cohesive approach to capacity development activities by WMO in assisting Members to meet their mandates and contribute to the goals of the WMO. The overall objective of the CDS is to foster effective capacity development assistance to WMO Members and facilitate sustainable development of their National Meteorological and Hydrological Services (NMHSs), particularly in developing countries, LDCs and SIDS. The CDS seeks to build upon existing capacities in NMHSs, reduce duplication and utilize opportunities to leverage investments in strategic partnerships and synergies, while integrating the roles and requirements of regional associations, technical commissions, WMO co-sponsored Programmes as well as WMO Programmes within the strategic priority areas in the provision of development assistance to Members.

While the CDS requires a collaborative approach to what is a common goal, particular emphasis is given to the role of the national governments, especially in planning and sustaining the capabilities of the NMHSs in partnership with regional and global community, and in recognition of the importance of the NMHSs to public safety, security, national development and general social and economic benefits which flow from weather, climate and hydrological services. Correspondingly, the CDS is designed to have its greatest impact at country level. WMO’s facilitative role will focus on strengthening NMHSs, enhancing sub-regional, regional and global cooperation while providing a framework for NMHSs to advocate services which further national policies, strategies and plans.

Distinction is made between “capacity building” and “capacity development”. The former approaches



development as if no capacity currently exists and the later considers existing capacities with an emphasis on a more holistic approach and national ownership of the development process. WMO's use of the term "capacity development" is to recognize that, in most cases, WMO assistance to NMHSs must be informed by existing and planned capacities.

The CDS recognizes that there are four types of NMHSs capacity: institutional, infrastructural, procedural and human resources. These four dimensions of capacities are distinct yet inter-related and must be considered holistically to achieve sustainable capacity development. The CDS also recognizes that WMO capacity development activities should be monitored and results evaluated for sustainability over time.

2. Strategy

2.1 Vision and Mission

Capacity development vision

Stronger NMHSs to meet society's need for information on weather, climate and water for the safety and well-being of people throughout the world.

Capacity development mission

To facilitate a holistic and integrated approach to sustainable capacity development of NMHSs especially in developing countries, LDCs and SIDSs through: advocacy, education and training, outreach, partnerships and resource mobilization, demonstration and pilot projects, service delivery and research.

2.2 Strategic Objectives and Strategic Approaches

Objective 1: Define required capacities and identify deficiencies

An accurate understanding of the required capacities will help formulate appropriate capacity development responses, prioritize investments, and mobilize resources. Baseline information is also vital for the monitoring and evaluation of capacity development activities and for continuous improvement of operations. Requirements and deficiencies will be derived from information relating to the compliance of NMHSs with WMO standards and the service needs of different stakeholders, end users and the society as a whole. Emphasis in Objective 1 will be placed on guidance for the defining of requirements, training on service delivery/stakeholder relations, compliance to WMO standards, clarification of institutional relationships and identifying deficiencies in the delivery, use and impact of weather, climate and hydrological services.

Strategic Approaches include:

- 1.A: Emphasize compliance with WMO technical requirements to address priorities
- 1.B: Assist countries in identifying deficiencies of the NMHSs
- 1.C: Encourage development of services to address specific user needs
- 1.D: Establish modalities for partner and stakeholder engagement

Objective 2: Increase visibility and national ownership

National ownership is the foundation for the enabling environment needed to ensure sustainable development of the NMHSs. The CDS will seek to create closer cooperation between government ministries and departments that are responsible for NMHSs and those sections of government responsible for setting national priorities to secure political buy-in and goodwill in favour of NMHSs within their respective countries. Through these efforts, Members will recognize the national and international significance of investing in the NMHSs as part of their national development priorities



reflected in National Development Plans and Poverty Reduction Strategy Papers (PRSPs), and in essence, demonstrate ownership and commitment needed for sustainable development of the NMHSs.

Socio-economic benefits will be emphasized so that NMHSs are engaging in a strong and long-term partnership with their governments and thus secure national ownership based on requirements, benefits and deficiencies. This is particularly important given current trends in development financing which lay emphasis on alignment with the priorities of governments reflected in National Development Plans or National Poverty Reduction Strategy Papers to attract domestic and external financing.

Coordination amongst partners will be strengthened to avoid duplication and foster the sharing of resources. This coordination is needed to develop, mobilize and harmonize investments for the capacity development of NMHSs of Members. In-country engagement with stakeholders by NMHSs will be seen as part of a wider process of strategic management and an integral part of developing capacity through clear institutional arrangements, roles and responsibilities, and national ownership.

Strategic Approaches include:

- 2.A: Emphasize socio-economic benefits of services provided by NMHSs to decision makers
- 2.B: Assist NMHSs to incorporate requirements into national policy, legislative frameworks and national development plans
- 2.C: Enhance outreach to end users and decision makers
- 2.D: Develop leadership and management capacities
- 2.E: Reinforce national support to meet societal needs for weather, climate and hydrology services

Objective 3: Optimize knowledge management

Knowledge management serves to improve activities across the CDS and is particularly important to support definition of requirements, needs, gaps and priorities. Knowledge management will provide for continuous renewal of information, best practices, and shared skill across WMO. This Objective will involve the creation of supportive organizational structures, putting in place Information and Communication Technologies (ICT) with emphasis on teamwork and diffusion of knowledge that can assist in capacity development. Strategy Objective 3 will optimize knowledge management as well as foster the sharing of experiences and shared resources by NMHSs through RAs and in partnership with regional bodies and entities. The use of ICT will enable effective collaborative approaches, real-time information sharing, monitoring and feedback. Encouraging communities of practise will complement the ICT recognizing the importance of human interaction for knowledge management. The sharing of needed skills and information will include the use of volunteers and third party contributions.

Strategic Approaches include:

- 3.A: Enhance mechanisms for collecting and sharing of up-to-date information relating to NMHSs development
- 3.B: Share best practices and success stories relating to the development of NMHSs
- 3.C: Enhance communities of practice dealing with the development of NMHSs

Objective 4: Reinforce resource mobilization and project management

Weather, climate and hydrological services are becoming core issues for development in many of the developing countries and are resulting in increased interest for investments by development funding



mechanisms. Resource mobilization and project management assistance will be provided to developing countries to build their NMHSs. The development of a stronger regional approach will help the implementation of capacity development activities. The institutional arrangements that enable project and programme implementation for capacity development will be strengthened and human resources developed to address the increased challenges for interaction with development agencies. Voluntary cooperation and bilateral assistance will also be facilitated and encouraged.

Strategic Approaches include:

- 4.A: Enhance coordination and actively explore new funding opportunities and develop proposals through dialogue with stakeholders and development partners
- 4.B: Enhance capacity to develop, implement, monitor and evaluate projects
- 4.C: Encourage innovative voluntary and bilateral cooperation

**Objective 5:
Strengthen global, regional and sub-regional mechanisms**

Global, regional and sub-regional mechanisms are critical to the work of the NMHSs. WMO's global and regional centres, which already provide a range of assistance in technical areas, training, and operational data exchange and guidance, need to be strengthened to better support NMHSs in line with WMO priorities. In addition, WMO's engagement through political and scientific mechanisms and initiatives will bring attention to capacities needed to deliver required services.

Strategic Approaches include:

- 5.A: Strengthen the work of global and regional centres
- 5.B: Strengthen global, regional and sub-regional mechanisms to provide support for weather, climate and hydrological services

**Objective 6:
Increase education and research opportunities**

Skilled individuals with competencies relevant for service delivery are essential to the operations of NMHSs. Education and research activities are long-term processes that build the foundation for products and services. The WMO Fellowship Programme provides important basic education for current and future NMHSs employees in developing countries, LDCs and SIDSs based on the most recent developments in science and technologies that form the basis for services

Strategic Approaches include:

- 6.A: Improve access to and provision of fellowships
- 6.B: Strengthen applications of research findings