FIT-4-NMP

Strategic and targeted support
to incentivise talented newcomers
to NMP projects under Horizon Europe

How to write Section 2 “Impact”

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Section 2: Impact

- Section 2.1: Project's pathways towards impact
  - EC recommended length: 4 pages
- Section 2.2: Measures to maximise impact - Dissemination, exploitation and communication
  - EC recommended length: 5 pages, including Section 2.3
- Section 2.3: Summary

Section 2.1: Project's pathways towards impact

1. Provide a narrative explaining how the project's results are expected to make a difference in terms of impact, beyond the immediate scope and duration of the project. The narrative should include the components below, tailored to your project.

   a) Describe the unique contribution your project results would make towards (1) the outcomes specified in this topic, and (2) the wider impacts, in the longer term, specified in the respective destinations in the work programme.

   b) Give an indication of the scale and significance of the project's contribution to the expected outcomes and impacts, should the project be successful. Provide quantified estimates where possible and meaningful.

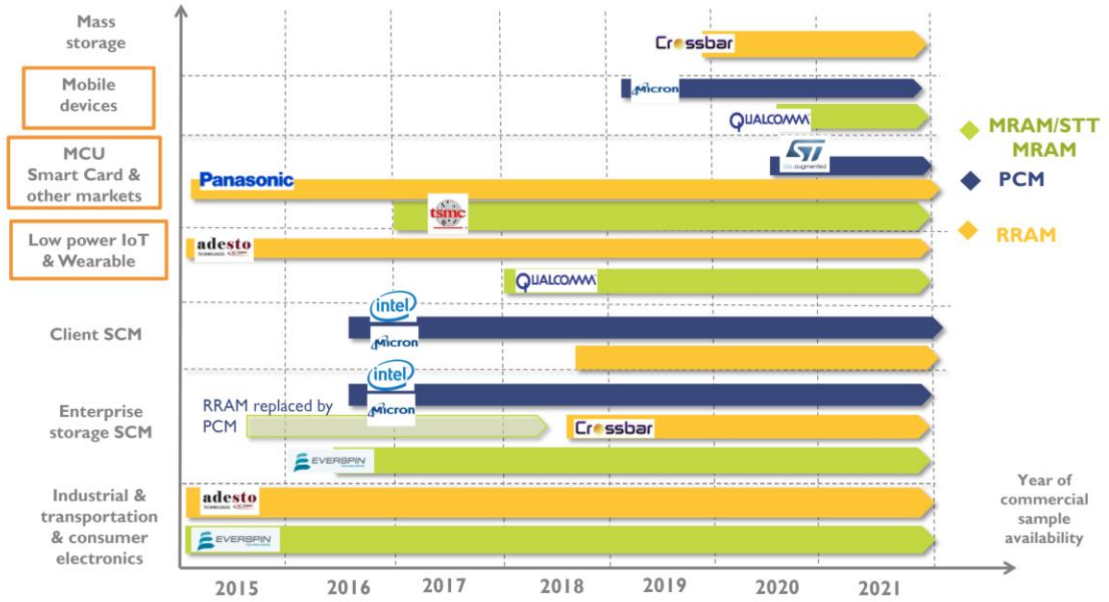
   c) Describe any requirements and potential barriers - arising from factors beyond the scope and duration of the project - that may determine whether the desired outcomes and impacts are achieved. These may include, for example, other R&I work within and beyond Horizon Europe; regulatory environment; targeted markets; user behaviour. Indicate if these factors might evolve over time. Describe any mitigating measures you propose, within or beyond your project, that could be needed should your assumptions prove to be wrong, or to address identified barriers.

Section 2.1: Project's pathways towards impact
"Describe unique contribution of project results towards (1) topic outcomes and (2) wider impacts" (1 of 2)

Write in a narrative and engaging style (e.g. Marketing)

2.1.2 Helping to double economic value of semiconductor component production in Europe within 10 years

MNEMOSENE is focused on CIM and memristors which are disruptive technologies that are expected to create vast economic returns over the coming years. MNEMOSENE will assist European organisations to enter and maintain a position in this rapidly evolving technology market place and thereby support the Electronics Leaders Group's target of doubling the economic value of semiconductor component production in Europe within the next 10 years. The anticipated explosive growth for CIM and memristors is reflected in recent market reports. Yole Development forecasts the emerging market for memristor-based non-volatile memory (NVM) will surge from $56 million in 2015 to $4.6 billion by 2021. Similarly, Allied Market Research valued the global memristor market at $3.2 Million in 2015 and expected it to reach $79.0 million by 2022.



Section 2.1: Project's pathways towards impact *"Indicate the scale and significance of the project's contribution to expected outcomes and impacts"* (1 of 2)

Expected outcomes – see text of call topic

Expected Outcomes	WP	Performance Indicators	Target
Outcome 1: Support the "Economic & Investment Plan" and "Innovation Agenda" for WBC by spurring economic recovery, supporting green and digital transition, fostering regional integration & EU convergence.	1, 2, 3, 4 and 5	• Preparatory research project on sustainable nanosensor on water pollution • Sustainable nanosensors developed to detect different water pollutants • Rivers and lakes in Albania where sustainable nanosensors are demonstrated • Joint research papers published in international peer-reviewed journals • Joint research papers presented at international conferences • SUSNANO workshops for private and public organisations in Albania • Info-days and networking sessions attended about EU calls for proposals • Joint research proposals submitted for EU funding (e.g. Horizon Europe) • Patents submitted by UT researchers involved in SUSNANO • Collaboration agreements between UT and Albanian private companies	1 3 8 9+ 9+ 3+ 5+ 3+ 2+ 3+
Outcome 2: Improved excellence capacity and resources in WBC enabling to close the still apparent research and innovation gap within Europe.	1, 2, 3 and 5	• UT experienced researchers trained in Research Sub-Topics A, B and C • UT early-stage researchers trained in Research Sub-Topics A, B and C • Summer schools hosted by UT, ICN2 and UPO • Joint PhD programme • Joint research papers published in international peer-reviewed journals • Joint research papers presented at international conferences • Increase in average H-Index of UT researchers involved in SUSNANO • Patents submitted by UT researchers involved in SUSNANO • Collaboration agreements between UT and Albanian private companies	5 10 3 1 9+ 9+ >15% 2+ 3+

Section 2.1: Project's pathways towards impact *"Indicate the scale and significance of the project's contribution to expected outcomes and impacts"* (2 of 2)

Expected impacts – see introductory text in work progamme

Expected Impacts for Destination 1 "Improved access to excellence"	Outcome 1	Outcome 2	Outcome 3	Outcome 4	Outcome 5	Outcome 6
Impact 1: Increased science and innovation capacities for all actors in the R&I system in widening countries.	X	X	X			X
Impact 2: Structural changes leading to a modernised and more competitive R&I systems in eligible countries		X	X			
Impact 3: Reformed R&I systems & institutions leading to increased attractiveness & retention of researchers		X	X			X
Impact 4: Higher participation success in Horizon Europe and more consortium leadership roles		X	X	X	X	X
Impact 5: Stronger linkages between academia and business and improved career permeability	X				X	
Impact 6: Strengthened role of the Higher Education sector in research and innovation		X		X	X	
Impact 7: Greater involvement of regional actors in R&I process	X		X			

Section 2.1: Project's pathways towards impact
"*Describe any requirements and potential barriers*" (1 of 2)

Identify challenges / barriers in EU Strategic Research Agendas

Section 2.1: Project's pathways towards impact
"Describe any requirements and potential barriers" (2 of 2)

Describe project mitigation measures for each barrier / challenge

Potential barriers and requirements specific to sustainable nanosensors based on graphene

Challenge 1: Stability of graphene-based materials. The main challenge is maintaining the stability of graphene-based materials since they are prone to aggregation which results in decreased electrochemical properties.

⇒ SUSNANO's mitigation measure: we will provide graphene-related materials equipped with different functional groups overcoming such drawbacks.

Challenge 2: Limit of detection (LOD) of sustainable nanosensors. Development of novel sustainable nanosensors with a low LOD is essential since target analytes often exist only at trace concentrations in real samples.

⇒ SUSNANO's mitigation measure: we will develop graphene materials exhibiting significantly improved electrical conductivity compared to conventional graphene-based materials, which enable to build ultrasensitive nanosensors with enhanced values of LOD.

Challenge 3: Suppressing the non-specific adsorption of interfering species. The main drawback related to conventional graphene-based nanosensors is connected with non-specific adsorption of interfering species which results in lower selectivity and sensitivity of developed nanosensors.

⇒ SUSNANO's mitigation measure: we will prepare graphene-based materials modified with different functional groups which can selectively capture the target analytes.

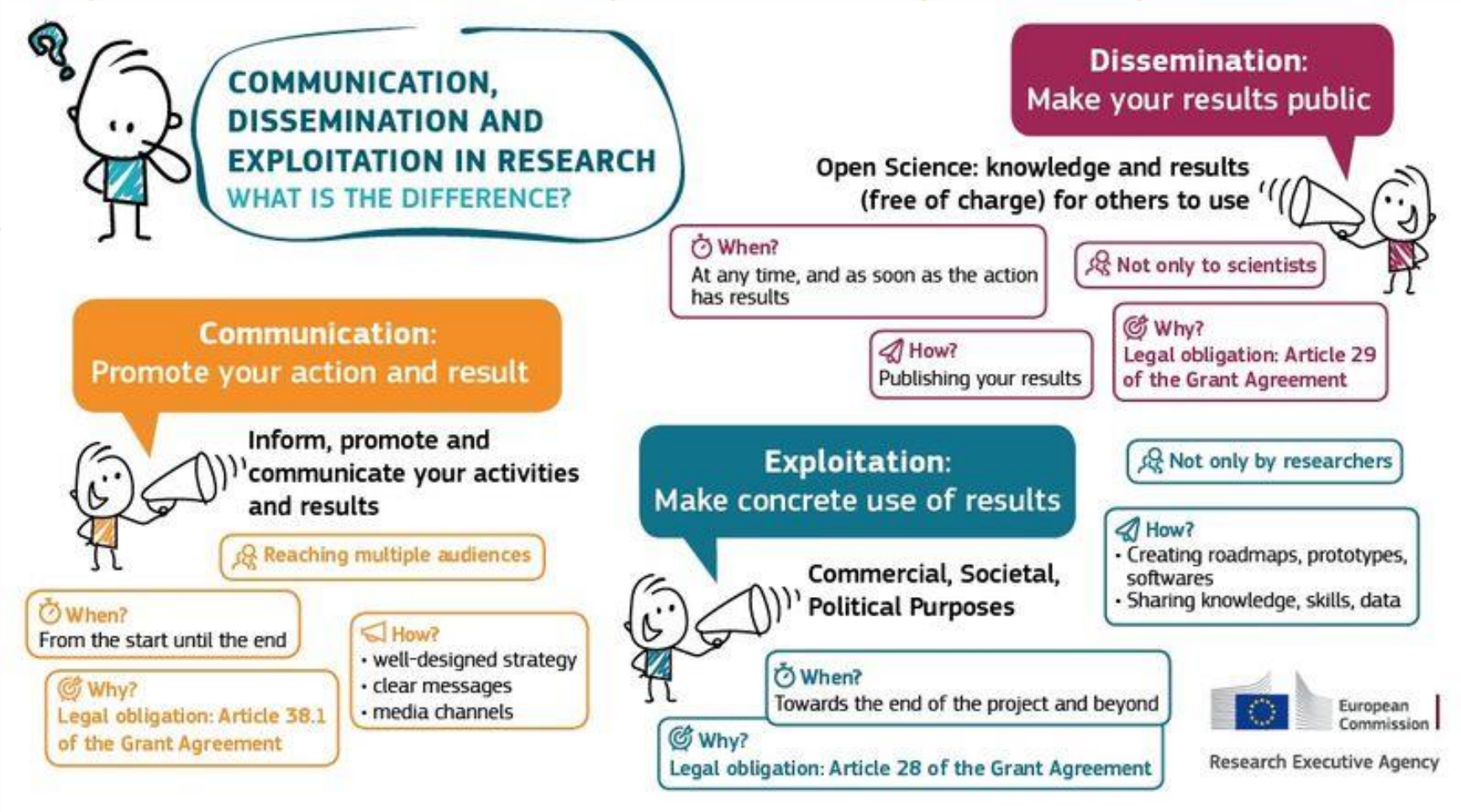
Challenge 4: Stability of sustainable nanosensors. The stability of nanosensors is the main challenge limiting their testing in real applications. Nanosensors are often evaluated by their shelf-life. Hence, it is important to develop sensing platforms capable to operate for long time. When using commonly available graphene-based materials, long-term stability becomes a major concern due to the issue related to aggregation of individual graphene flakes.

⇒ SUSNANO's mitigation measure: we will provide graphene-related materials equipped with different functional groups which can overcome such handicap.

Section 2.2: Measures to maximise impact - Dissemination, exploitation and communication (1 of 2)

1. Describe the planned measures to maximise the impact of your project by providing a first version of your ‘plan for the dissemination and exploitation including communication activities’. Describe the dissemination, exploitation and communication measures that are planned, and the target group(s) addressed (e.g. scientific community, end users, financial actors, public at large).
2. Outline your strategy for the management of intellectual property, foreseen protection measures, such as patents, design rights, copyright, trade secrets, etc., and how these would be used to support exploitation.

Section 2.2: Measures to maximise impact - Dissemination, exploitation and communication (2 of 2)

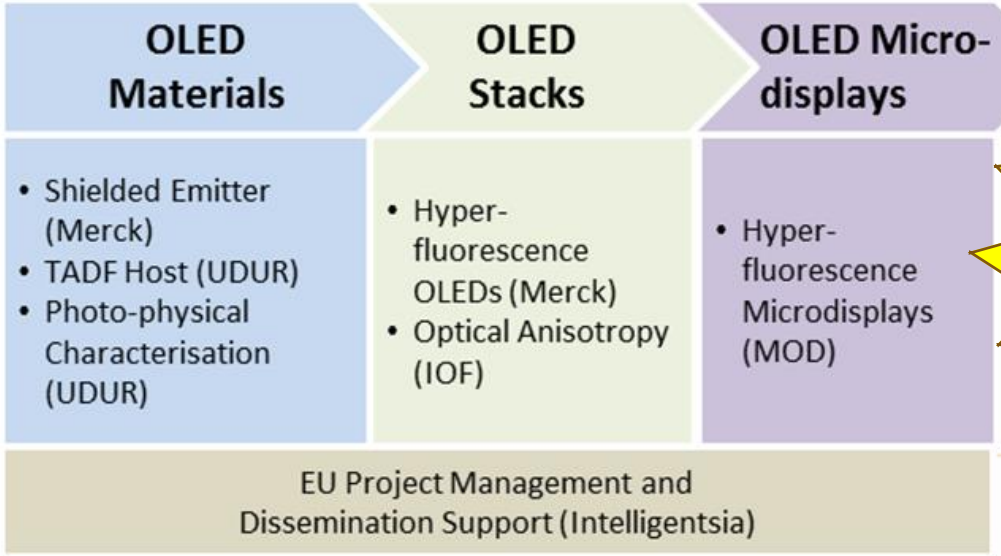


Section 2.2: Measures to maximise impact - Dissemination, exploitation and communication *"Provide 1st version of plan for dissemination, communication & exploitation"* (1 of 4)

MNEMOSENE Dissemination and Communication Plan			
Project Result	**Dissemination Activity**	**Target Audience**	**Target Indicator**
Project leaflet and poster	Distribute during international conferences (e.g. ISSCC, ESSCIRC and DATE), public seminars and outreach events.	Scientists, engineers and general public	400+ leaflets distributed, 30+ events where poster displayed (including 9+ outreach events)
Project website	Publish project summary, regular news and event updates on website.	Scientists, engineers and general public	5000+ visitors
Project news	Publish project news releases and distribute through broader scientific news channels e.g. Cordis wire and Alpha Galileo.	Scientists, engineers and general public	3+ news releases, 10+ articles in broader scientific press
	Distribute project news releases via social media (e.g. LinkedIn, Facebook, Twitter, etc)	Scientists, engineers and general public	15+ announcements
Short project film	Publish film on Youtube and project website. Show during public outreach events.	Scientists, engineers and general public	1000+ hits, 9+ public outreach events
Open workshops	Present research results at open workshops: • MemTDAC workshops on memristor technology during the annual HiPEAC conference. • Workshops at DATE conferences (e.g. Workshop on Emerging Memory Solutions) • MemoCiS COST action workshops.	Scientific research community and industrial actors (SMEs and MNEs)	5+ open workshops
Scientific results from development of non-volatile memory domain technologies and methods.	Publish results in international peer reviewed journals (e.g. IEEE Journals). Gold open-access approach scheme will be adopted whenever possible.	Scientific research community	15+ journal papers
	Present results at international scientific conferences: materials and device technology (e.g. ESSCDRC, IEDM, SISPAD), circuit and hardware design (e.g. DATE, ISSCC, DAC, ISCAS), micro architecture and computing (e.g. MICRO, ISCA, HiPEAC, PACT), software technology and programming (e.g. CGO, PPoPP, CC, CSE), big-data applications (e.g., Int. Conf. on Big Data, IEEE BigDataSE), together with journals in the same fields (ISS, TC, Micro, TED, TOPLAS, TACO, etc.).	Scientific research community	15+ conferences
	Present results during seminars for university Master's students.	Young postgraduate students	6+ seminars

Dissemination and Communication

Section 2.2: Measures to maximise impact - Dissemination, exploitation and communication *"Provide 1st version of plan for dissemination, communication & exploitation"* (2 of 4)



Value chain for OLED proposal

Partners' individual exploitation plans

Partner	Individual Exploitation Plan
Merck (industrial partner)	Merck already supplies OLED materials for current state-of-the-art AMOLED displa… …es an established process of scaling-up material production from small R&D quantities to custome… …n and finally into standard production size. As recently reported, Merck is constantly investing … …uction capacity in Germany to answer to the increasing customer requests. OLED device manufa… …are mostly located in Asia and Merck already intensively cooperates with all display manufacturers in thi… …g. LG Display, SDC, AUO, EDO, Visionox, BOE, Tianma and JDI). Similar to its successful history in Liquid Crystal … …aterial business, Merck is dedicated to develop the OLED technology focussing on the customers' technological and commercial needs. The core material production technology is developed in Europe and will be marketed to customers worldwide. **Based on HyperOLED's commercial potential, Merck has prepared the following post-project business plan …**
UDUR (academic partner)	UDUR have a very strong track record of publishing journal papers as well as collaborating with industry in the fields of OLED material synthesis and characterisation. Notably, Professor B. (h-index=57, >14,500 citations, 10 patents) and Professor M. (h-index=53, >10,500 citations, 7 patents) are world-renowned experts in their respective fields. Also, Lomox Ltd funds UDUR for the synthesis of OLED materials and Merck currently funds a PhD studentship at UDUR in photophysical studies of non-TADF OLED materials. Consequently, UDUR's plans to exploit the HyperOLED results include: • Publishing papers in international journals based on the project results (e.g. Nature Materials) • Attracting further public/private funding for R&D projects requiring their expertise in "OLED material synthesis" and "Photo-physical characterisation" (e.g. Novaled and EPSRC) • Licensing their IP created in the project (see earlier IP Ownership Tables)
etc.	

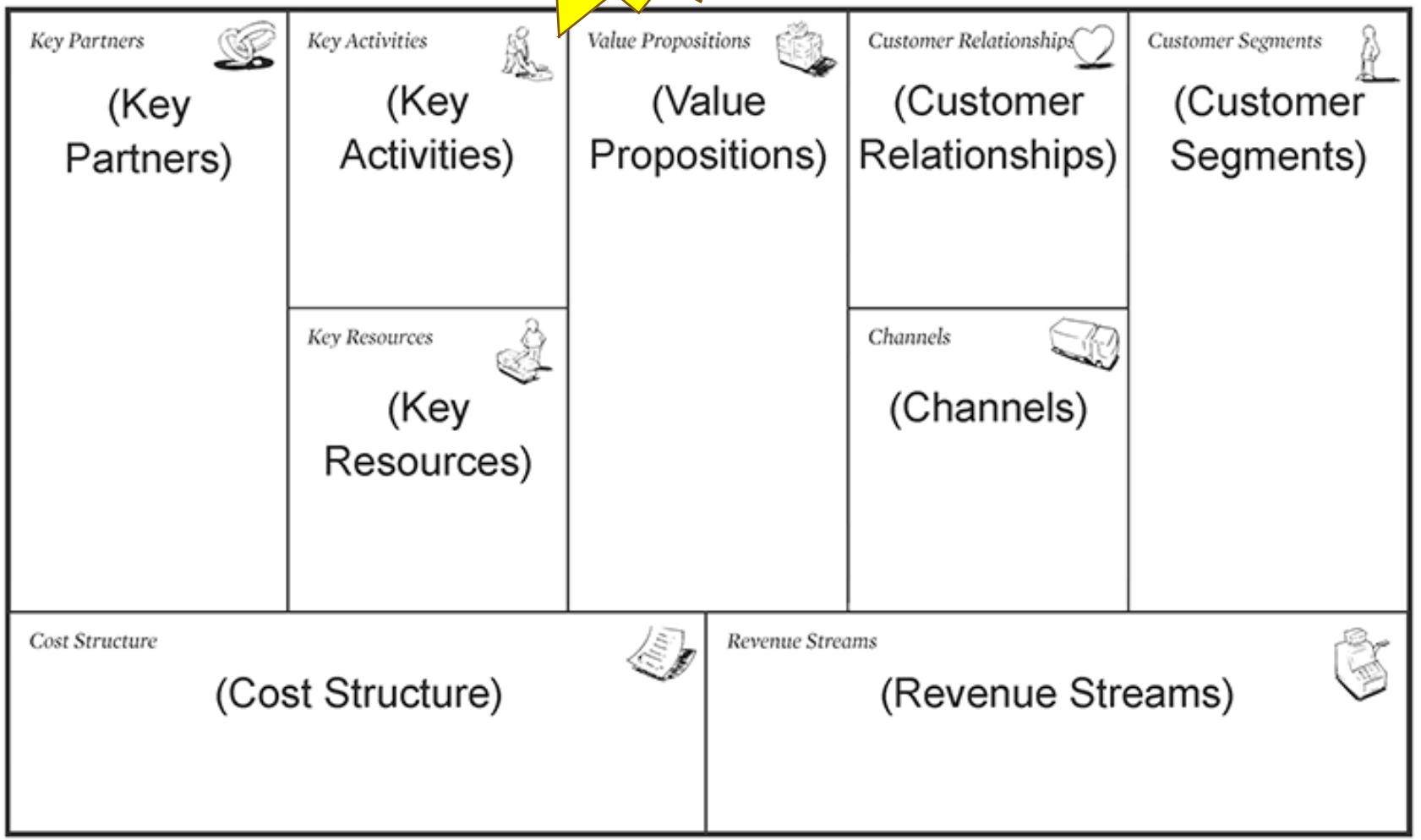
Section 2.2: Measures to maximise impact - Dissemination, exploitation and communication *"Provide 1st version of plan for dissemination, communication & exploitation"* (3 of 4)

TRL		BRL	
TRL9	Technology system proven in operational environment	BRL9	Business model finalised. Business scaling with recurring revenues.
TRL8	Technology system completed & qualified through test and demonstration	BRL8	Business model is fine-tuned. Sales & metrics show business model holds and can scale.
TRL7	Prototype demonstrated in an operational environment	BRL7	Product/market fit demonstrated. Attractive revenue/cost projections
TRL6	Technology demonstrated in a relevant environment	BRL6	Full business model including pricing verified on customers
TRL5	Technology validated in a relevant environment	BRL5	Business model testing, first revenue model, competitive position verified in market
TRL4	Technology validated in the laboratory environment	BRL4	First version of business model, first projections of economic viability & market potential
TRL3	Analytical & experimental PoC of critical function and characteristics	BRL3	Draft of business model Described market potential & competitive overview
TRL2	Technology concept and/or application formulated	BRL2	First business concept described. Identified overall market & some competitors
TRL1	Basic principles observed	BRL1	Hypothesizing on possible business concept

Technology Readiness Levels (TRL) + Business Readiness Levels (BRL)

Section 2.2: Measures to maximise impact - Dissemination, exploitation and communication *"Provide 1st version of plan for dissemination, communication & exploitation"* (4 of 4)

Business Model Canvas



Section 2.2: Measures to maximise impact - Dissemination, exploitation and communication

"Outline strategy to manage intellectual property" (1 of 2)

IP Ownership Tables		
Expected Foreground Knowledge	**Lead Partner Concerned**	**Other Partners claiming Ownership Rights**
Related to WP1		
New algorithms to tackle problems related to data analytics that are optimized for implementation in a CIM-based architecture	IBM, TUD, ARM	TUE
New algorithms to tackle problems related to healthcare and database applications that are optimized for implementation in a CIM-based architecture	TUD	TUE
Related to WP2		
2-D SIMD programming element	TUE, INRIA	ETHZ
Macro-programming interface for CIM tiles	TUE, INRIA	ETHZ
Portable programming model for CIM-accelerated kernels	TUE, INRIA	ETHZ
Related to WP3		
CIM macro architecture	TUE	TUD, ETHZ and ARM
Embedded circuits and energy-efficient digital/analogue interfacing between resistive compute units and external digital compute units	TUE, ARM	TUD, ETHZ
Related to WP4		
Models to enter into the micro-architecture simulator	IMEC, RWTH	-
CIM microarchitectures	IMEC	RWTH, ARM, IBM, TUD
PCM-based logical and arithmetic operations that can be implemented in a CIM module	IBM	-
Designs for parallel bit-wise and arithmetic operations within the crossbar	TUD	RWTH
Related to WP5		
Data collected based on measurements of crossbars (CIM)	TUD, RWTH	TUE, ETHZ, ARM, IBM,
Full CIM simulator	TUD	All

Capture initial strategy for Foreground Knowledge

Section 2.2: Measures to maximise impact - Dissemination, exploitation and communication

"Outline strategy to manage intellectual property" (2 of 2)

Background Knowledge	Contributing Partner	Included	Excluded
Related to WP2			
PENCIL language for domain-specific compilation	INRIA	X	
Skeleton-based instantiation from Bones framework	TUE	X	
New loop-nest fusion and inter-tile reuse techniques	TUE	X	
Related to WP3			
Two patents filed on resistive computing and computation-in-memory architecture	TUD	X	
Related to WP4			
Low level detailed non-volatile memory compiler models (STT_MRAM, SOT-MRAM, OxRAM, VMCO, CBRAM, NAND Flash)	IMEC		X
Black box models for non-volatile memories (STT_MRAM, SOT-MRAM, OxRAM, VMCO, CBRAM, NAND Flash)	IMEC	X	
PCM-based physical models that are not confidential	IBM	X	
Confidential information concerning PCM device technology	IBM		X
Circuit design schemes within the crossbar	TUD	X	

Don't overlook initial strategy for Background Knowledge!

Section 2.3: Summary

1. Provide a summary of this section by presenting in the canvas below the key elements of your project impact pathway and of the measures to maximise its impact. (1 of 2)

KEY ELEMENT OF THE IMPACT SECTION

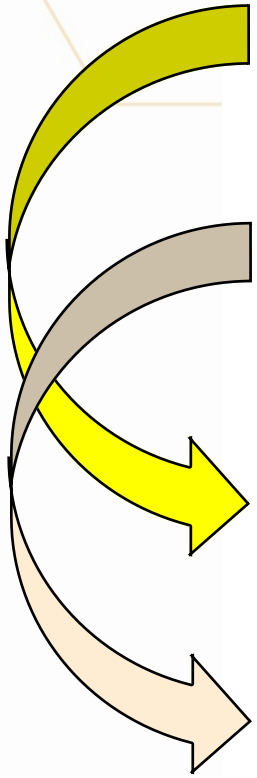
SPECIFIC NEEDS	EXPECTED RESULTS	D & E & C MEASURES
What are the specific needs that triggered this project? Example 1 Most airports use process flow-oriented models based on static mathematical values limiting the optimal management of passenger flow and hampering the accurate use of the available resources to the actual demand of passengers. Example 2 Electronic components need to get smaller and lighter to match the expectations of the end-users. At the same time there is a problem of sourcing of raw materials that has an environmental impact.	What do you expect to generate by the end of the project? Example 1 **Successful large-scale demonstrator:** Trial with 3 airports of an advanced forecasting system for proactive airport passenger flow management. **Algorithmic model:** Novel algorithmic model for proactive airport passenger flow management. Example 2 Publication of a **scientific discovery on transparent electronics.** **New product:** More sustainable electronic circuits. **Three PhD students trained.**	What dissemination, exploitation and communication measures will you apply to the results? Example 1 **Exploitation:** Patenting the algorithmic model. **Dissemination towards the scientific community and airports**: Scientific publication with the results of the large-scale demonstration. **Communication towards citizens:** An event in a shopping mall to show how the outcomes of the action are relevant to our everyday lives. Example 2 **Exploitation of the new product:** Patenting the new product; Licencing to major electronic companies. **Dissemination towards the scientific community and industry:** Participating at conferences; Developing a platform of material compositions for industry; Participation at EC project portfolios to disseminate the results as part of a group and maximise the visibility vis-à-vis companies.

Section 2.3: Summary

1. Provide a summary of this section by presenting in the canvas below the key elements of your project impact pathway and of the measures to maximise its impact. (2 of 2)

TARGET GROUPS	OUTCOMES	IMPACTS
Who will use or further up-take the results of the project? Who will benefit from the results of the project? Example 1 **9 European airports**: Schiphol, Brussels airport, etc. **The European Union aviation safety agency.** **Air passengers (indirect).** Example 2 **End-users**: consumers of electronic devices. **Major electronic companies**: Samsung, Apple, etc. **Scientific community** (field of transparent electronics).	*What change do you expect to see after successful dissemination and exploitation of project results to the target group(s)?* Example 1 **Up-take by airports:** 9 European airports adopt the advanced forecasting system demonstrated during the project. Example 2 **High use of the scientific discovery published** (measured with the relative rate of citation index of project publications). A **major electronic company** (Samsung or Apple) **exploits/uses the new product** in their manufacturing.	*What are the expected wider scientific, economic and societal effects of the project contributing to the expected impacts outlined in the respective destination in the work programme?* Example 1 **Scientific:** New breakthrough scientific discovery on passenger forecast modelling. **Economic:** Increased airport efficiency Size: 15% increase of maximum passenger capacity in European airports, leading to a 28% reduction in infrastructure expansion costs. Example 2 **Scientific:** New breakthrough scientific discovery on transparent electronics. **Economic/Technological:** A new market for touch enabled electronic devices. **Societal:** Lower climate impact of electronics manufacturing (including through material sourcing and waste management).

Section 2.3: Summary
"Canvas showing key elements of the project's impact pathways and measures to maximise its impact"



No.	SPECIFIC NEEDS	EXPECTED RESULTS	D & E & C MEASURES
1	UT's SWOT analysis highlights weaknesses and threats which need to be addressed with respect to its R&I for sustainable nanosensors for water pollution detection (see Section 1.2.2).	See Performance Indicators for Outcomes 2, 3, 4, 5 and 6 in Section 2.1.2	Communication: News releases via Press conferences, Project website, and Social media accounts. Dissemination: Research papers presented at international conferences.
2	Albania's rivers and lakes are polluted with heavy metals, pesticides and antibiotics (see Section 1.2.1).	Development of novel sustainable nanosensors. Extensive environmental assessment of Albania's rivers and lakes (WP1).	Communication: as above. Dissemination: Present env. assessment report to National Environmental Agency and Ministry of Tourism and Environment Exploitation: Industry workshops at UT and NanoAlb.

No.	TARGET GROUPS	OUTCOMES	IMPACTS
1	UT's Dept of Chemistry and UT's Directorate of Scientific Research, Projects and Foreign Relations.	Increased UT research papers in journals / conferences; Increased UT EU grant proposals.	Scientific/Economic: Albania's increased participation in EU R&D funding programmes.
2	Public organisations: e.g. National Environmental Agency, Ministry of Tourism and Environment Academic Associations: e.g. NanoAlb Private companies: e.g. EHW, LUFRA	Evidence-based policy development by Albanian government. Collaboration agreements between UT & Albanian private companies.	Societal: Albania's supported green transition and increased integration with EU. Technological/Economic: Albania's spurred digital transition and economic recovery.