Non-paper

5 December 2019

DRAFT ORIENTATIONS TOWARDS AN IMPLEMENTATION ROADMAP - CONNECTING EUROPE FACILITY (CEF2) DIGITAL

Disclaimer: This non-paper does not present a draft of the future work programme for the implementation of the CONNECTING EUROPE FACILITY (CEF2) DIGITAL. It is based on the provisions of the 'CEF2 common understanding' and is fully consistent with Articles 8, 9(4) and the indicative list contained in Part V of the Annex of the future CEF2 Regulation. The objective is to provide orientations for ongoing discussions and exchanges of ideas for its future implementation.

1. Introduction and policy context

In June 2018, the European Commission adopted a proposal for a Regulation establishing the Connecting Europe Facility programme for 2021-2027 (CEF2)[1]. Building on the previous Connecting Europe Facility, CEF2 is a co-financing programme directly managed by the Commission that supports the development of strategic high-performance infrastructure to connect and integrate the Union and its regions in the transport, telecommunications and energy sectors.

By supporting the deployment of trans-European networks, CEF2 should:

- facilitate cross-border connections;
- foster greater economic, social and territorial cohesion; and
- contribute to competitiveness and smart, sustainable and inclusive growth throughout the EU.

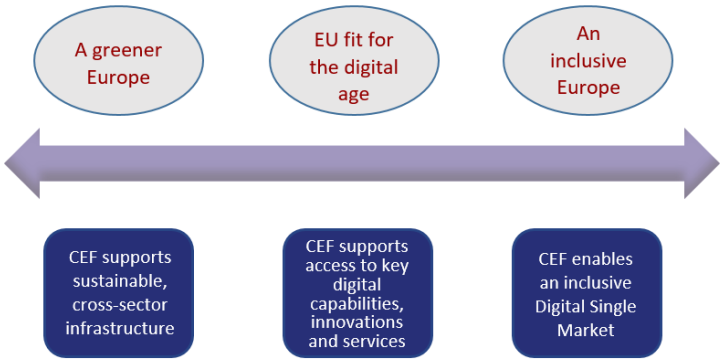
In March 2019, the European Parliament and the Council reached a partial provisional agreement ('the CEF2 common understanding'[2]) on all substantive elements of the proposal, including the objectives, the actions to be supported and the means for implementing the programme[3]. While the actual envelope of the programme for the period 2021-2027 will not be decided until there is an agreement on the next EU long-term budget and while adjustments may still be necessary following the finalisation of those inter-institutional negotiations, including on certain horizontal provisions, this common understanding gives a clear indication of the actions that CEF2 should fund and of its implementation rules.

The CEF2 provisional agreement envisages that the Commission should adopt the first **multiannual work programmes** by 31 December 2020. These will set out a timetable of calls for proposals for 2021-2023, the topics to be covered, an indicative budget and a prospective framework for the entire programming period (2021-2027).

In particular, the provisional agreement provides that CEF2 Digital has the objective to contribute to the development of **projects of common interest** as defined in Article 8 with the following actions which are eligible to receive EU financial assistance:

- the deployment of and access to very high-capacity networks, including 5G systems, capable of providing Gigabit connectivity in areas where socio-economic drivers are located;
- the provision of very high-quality local wireless connectivity in local communities that is free of charge and without discriminatory conditions;
- uninterrupted coverage with 5G systems of all major transport paths, including the trans-European transport networks;
- deployment of new or significant upgrade of existing backbone networks including submarine cables, within and between Member States and between the Union and third countries;
- Implementing digital connectivity infrastructure requirements related to cross-border projects in the areas of transport or energy and/or supporting operational digital platforms directly associated to transport or energy infrastructures.

CEF2 Digital can support digital connectivity infrastructure projects of common interest identified in the framework of guidelines adopted by the Union legislator, in accordance with Article 171(1) TFEU, and in line with the **policy goals of the Commission**[4] (in particular, 'a Europe fit for the digital age', 'an economy that works for people' and 'a European green deal').



CEF2 Digital should support **strategic projects with significant benefits for the EU**, complementing existing and forthcoming forms of support for digital connectivity infrastructures. The focus should be on **infrastructure investments that would not be prompted by market forces alone**, including in rural areas and/or the outermost regions.

The next steps

The purpose of this non-paper is to set out strategic orientations and general implementation guidelines for the first three years (2021-2023) of the digital part of the CEF2 programme (CEF2 Digital), i.e. the €3 billion proposed by the Commission for the component devoted to **strategic digital connectivity infrastructures** that make an important contribution to the Union's connectivity objectives[5] and/or support the digital transformation of the economy and society (Art. 8(1)).

Stakeholders need to be involved at an early stage in the preparations for the first work programmes, in order to secure consensus on their objectives, scope, priorities and performance data. This is also key to improving predictability and the quality of the projects to be submitted. This non-paper therefore proposes a set of strategic implementation priorities which are based on the stakeholder feedback received, in particular from the online public consultation[6] which ran from 3 July to 11 September 2019.

The CEF2 programme is going to be implemented on the basis of a work programme adopted by the Commission assisted by the CEF Coordination Committee, composed of representatives of the Member States. Any early discussions on the below-proposed funding priorities are therefore informal and relevant only to the digital part of CEF2.

2. The European dimension of CEF2 Digital

The EU can fully reap the benefits of the digital transformation if quality access to Gigabit networks is made available to all citizens, businesses and 'socio-economic drivers' (SEDs) such as schools, universities, hospitals, transport hubs, public administrations, etc., irrespective of their location and economic status. Consistent deployment of leading-edge digital connectivity infrastructures is needed to meet the increasing demand for the massive transfer and processing of geographically distributed data generated by the exponential growth of connected devices.

Digital connectivity infrastructures are being deployed at European, national, regional and local levels[7]. All such endeavours, financed by a variety of public funds and/or private investors, contribute to the achievement of the EU's 'Gigabit society' goals[8]. CEF2 Digital should leverage these infrastructures and act as a catalyst for the EU-wide digital ecosystem.

Through its holistic ('programmatic') approach and direct management at EU level, CEF2 Digital aims to reduce the fragmentation of investments, while ensuring the coherence and harmonisation of digital connectivity infrastructures and their efficient integration with other strategic infrastructures in the fields of transport and energy.

CEF2 Digital has the potential to complement other programmes such as the Digital Europe programme (DEP) and Horizon Europe, as well as national and regional investments in digital research, technological innovation and deployment, by supporting the necessary digital connectivity infrastructure.

The European dimension of CEF2 Digital should be reflected in the following strategic objectives:

- **Building pan-European, cross-border infrastructures for 5G uses case**

  CEF2 Digital can help to deploy 5G infrastructures along major transport paths, enabling service continuity and the interoperability of 5G services across the continent. An EU-level approach is key to avoiding a compartmentalisation of technological infrastructures and solutions, and to ensuring efficient investment. Also, these types of investment should have the critical mass needed to generate economic value, upstream and downstream in the value chain, which can be leveraged to build EU strengths in the sectors in question.

- **Accelerating implementation of digital connectivity policies and ensuring that nobody is left behind by the digital transformation**

  CEF2 Digital can contribute to the achievement of the 2025 Gigabit objectives[9] by complementing a wide range of EU financing instruments, including the European Regional Development Fund (ERDF), the European Agricultural Fund for Rural Development (EAFRD) and financial engineering tools to be made available through InvestEU.

  CEF2 Digital should:

  - cross-fertilise and incentivise public and private investments in connectivity infrastructures;
  - fill in connectivity gaps to ensure that local/regional infrastructures are efficiently connected in order to ensure end-to-end Gigabit connectivity; and
  - support strategic connectivity to remote regions (e.g. through submarine cables) and rural or sub-urban regions, which need it for their economic and social activity.

  This all-encompassing and inclusive approach to connectivity aims to give citizens and businesses access to the whole EU and accelerate the development of the digital single market.

  CEF2 Digital can provide the tools to accelerate the EU's digital connectivity performance (including the Digital Economy and Society Index), so that it keeps up with international standards and ensures that no community is left behind by the digital transformation.

- **Contributing to innovation and competitiveness in the EU digital ecosystem**

  CEF2 Digital can invigorate the digital readiness and competitiveness of the EU's business and industrial community.

  First, it can accelerate the modernisation of vertical sectors such as healthcare, energy, transport, education, agriculture and public administration, which rely heavily on universal access to reliable, affordable high-quality digital networks.

  Secondly, the deployment of Gigabit networks should generate greater aggregate demand for very high quality connectivity and user experience ('application pull'), e.g. use of virtual and augmented reality in e-learning applications, tele-operated robotics in surgery, data analytics in precision agriculture and environmental risk management, etc. These challenging application scenarios are expected to generate a spill-over effect on the supply side of the value chain, i.e. the deployment of newer generations of innovative technologies and infrastructures, which will in turn stimulate new and unforeseen use cases and application scenarios in the upstream value chain ('technology push').

  CEF2 investments aim to attract infrastructure and technology suppliers from around Europe, with a view to stimulating new EU-scale business opportunities around connectivity investments. CEF2 Digital can thus cross-fertilise with multiple programmes addressing

upstream innovations and services (e.g. DEP, Horizon Europe), for instance by enabling local talent and SMEs to benefit from key technologies and capabilities such as high-performance computing (HPC), the European cloud, artificial intelligence (AI) capabilities and big-data analytics. Services using CEF2 infrastructures will generate value at EU level and best practices that can be replicated elsewhere.

Finally, all CEF2 Digital can contribute to the European green deal by supporting smart, efficient and sustainable mobility and energy projects, and green ICT infrastructures, by supporting the replacement of copper networks with more sustainable optical fibre elements in the deployment of new very high capacity networks, including 5G and other state-of-the-art connectivity in market failure areas. With such a prioritisation, all CEF2 Digital projects will contribute to the EU's long-term decarbonisation commitments[10], e.g. citizens and businesses in formerly digitally excluded areas will be able to work and benefit from services without commuting.

- **Strategic autonomy and digital sovereignty**

  In order to face the challenges of the digital age, Europe needs advanced and robust digital connectivity infrastructures, build technological strengths and secure jurisdictional control over them. Such infrastructures are critical to underpin the functioning of digital platforms and services (e.g. cloud, big data, and business-to-business and business-to-consumers platforms) and therefore of the whole digital economy and society. The resilience of digital connectivity infrastructures, including their protection from cyberattacks, is a pre-condition for the EU's digital economy. Investment in robust high-capacity networks at EU level goes hand in hand with the development of cybersecurity policies and programmes[11]. CEF2 Digital can only co-finance the deployment of safe and secure very high capacity digital networks and 5G systems.

3. CEF2 Digital infrastructure investments (2021-2027)

CEF2 Digital aims to support projects that address market failure and do not crowd out or overbuild other equivalent investments in the relevant target area. As an EU-level public co-financing instrument, CEF2 Digital can attract private co-financing to address market failures, provided that the infrastructure targets areas in which no equivalent network, in terms of capabilities and/or functionalities, already exists (or is planned in the next 24 months[12]).

Therefore CEF2 Digital intends to prioritise projects which involve co-financing by entities (public or private) operating on market terms. If Members States would co-finance projects, they will have to ensure complementarity with previous or on-going investments supported by structural funds, as well as prior state aid compatibility in accordance with the applicable state aid rules.

In order to ensure the most efficient use of public funds, competing projects should, where appropriate, be evaluated on the basis of grant subsidy requested in relation to additional area coverage (e.g. households/SEDs, kilometres of 5G coverage) or capacity increase and/or reach generated.

In order to maximise EU added value, certain investments need to be prioritised in the first 3 years of the programme. On the basis of input from Member States and stakeholders, the Commission

services currently consider that the actions below could be prioritised as projects of common interest identified in the framework of the draft CEF2 Regulation.

Pillar 1: 5G infrastructure deployments in Europe

5G corridors

5G connects vehicles (e.g. cars, trains, boats) and will enable safer, faster, cleaner and more enjoyable trips. In order to boost 5G network coverage across Europe, CEF2 Digital should focus initially on cross-border 5G corridors on major transport paths, in particular those corridors planned in view of experimenting CAM applications. It should target motorways, railways and inland waterways, and aim to enable innovative smart mobility services for passenger and goods transport. It aims to stimulate the competitiveness of the telecom and transport industries, including the transition to connected and automated mobility (CAM)[13].

- *This action would be funded on the basis of eligible 'actions implementing uninterrupted coverage with 5G systems of all major terrestrial transport paths, including the trans-European transport networks' (draft CEF2 Regulation[14], Articles 3(2)(c), 8(3)(c) and 9(4)(c), and point 3 in Annex, Part V).*

5G communities

CEF2 Digital should help communities to become part of a competitive European digital economy, by accelerating private Gigabit network investments in areas where business cases for such investments are difficult. The focus should be on connecting SEDs with the energy-efficient fibre infrastructures needed to make digital services, including innovative 5G applications, available across Europe. In addition, building on the connectivity demand for WiFi4EU, CEF2 Digital could fund '5G4EU' projects that provide communities with 5G services for innovative applications.

- *This action could be funded on the basis of eligible actions 'supporting the deployment of and access to very high-capacity networks, including 5G systems, capable of providing gigabit connectivity in areas where socioeconomic drivers are located' (Articles 8(3)(a), 9(4)(a), and points 1 and 2 in Annex, Part V).*

Pillar 2: EU cross-border data infrastructures

Strategic terabit connectivity for HPC

The EU and the Member States are tackling major societal challenges by investing massively in digitalisation and innovation. The deployment of supercomputers (HPC) and data infrastructures will benefit a broad range of sectors (e.g. environment, energy, agriculture and health) and ultimately impact citizens, SMEs and industries. To ensure universal access to those resources, CEF2 Digital could support targeted investments in ultra-high capacity and low-latency links to interconnect the HPC centres and facilitate the connectivity bridging with cloud providers.

- *This action could be funded on the basis of eligible actions 'supporting deployment of new or significant upgrade of existing backbone networks including submarine cables, within and between Member States and between the Union and third countries' in line with Recital 28 (Articles 8(3)(d) and 9(4)(d)).*

Strategic backbone networks for pan-European sustainable cloud federations

Cloud technology will be an essential enabler for the roll-out of emerging technologies (AI, 'internet of things' (IoT), HPC) and strengthen data sovereignty in the coming decade[15]. The EU therefore needs efficient, secure, interoperable and sustainable cloud federations across the internal market. CEF2 Digital can provide targeted investments for cross-border, secure, energy-efficient and high-speed connectivity to connect existing cloud infrastructures across the EU. The goals would be to:

- foster the competitiveness of the cloud industry in line with our core data protection, security, portability and sustainability EU values;
- ultimately gain technological sovereignty; and
- guarantee balanced and trusted access to cloud services and infrastructures for all citizens, SMEs and industries across the EU.

- *This action would be funded on the basis of eligible actions 'supporting deployment of new or significant upgrade of existing backbone networks including submarine cables, within and between Member States and between the Union and third countries' as contribution to increase the capacity and resilience of the Union's digital networks (Articles 8(3)(d) and 9(4)(d)).*

Submarine connectivity of strategic importance

Submarine cables play an essential role in ensuring digital connectivity throughout the EU and they are also crucial for the international connectivity, increasingly seen as strategic, between the EU and its trading and research partners around the globe. By supporting strategic deployments of such cables, CEF2 Digital can have a positive impact on capacity and the commercial offers of backbone connectivity needed to link all parts of the EU to each other and to the world.

- *This action could be funded on the basis of eligible 'actions supporting deployment of new or significant upgrade of existing backbone networks including submarine cables, within and between Member States and between the Union and third countries' (Articles 8(3)(d) and 9(4)(d), and point 3 in Annex, Part V).*

Operational digital platforms and synergy projects

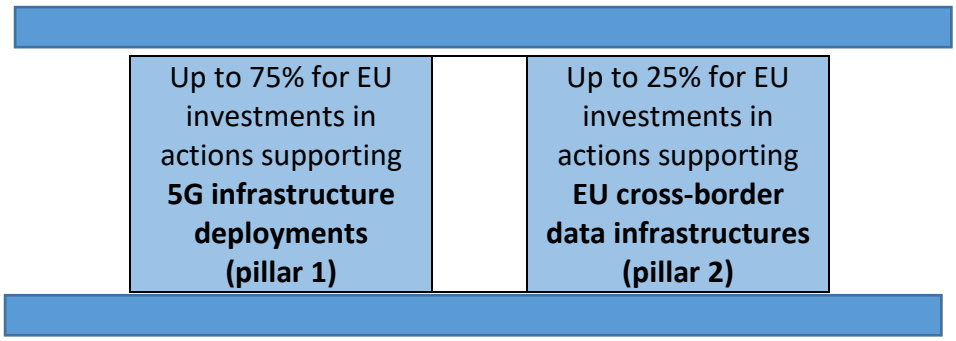
Digital technologies are the main driver of synergies between the digital, energy and transport sectors[16]. CEF2 Digital could fund operational digital platforms that ensure that digital services in the energy and transport networks can be implemented throughout the EU. The synergies would have a leverage effect on the innovation of energy and transport infrastructures, while providing spill-over opportunities for public and private actors to re-use the underlying digital connectivity infrastructures for many other purposes.

- *This action could be funded on the basis of eligible 'actions implementing digital connectivity infrastructure requirements related to cross-border projects in the areas of transport or energy and/or supporting operational digital platforms directly associated to transport or energy infrastructures' (Articles 8(3)(f) and 9(4)f).*

The technical annex to this non-paper illustrates in more detail how the indicative funding actions, presented for discussion, could be implemented in the first 3 years of CEF2 Digital implementation (2021-2024).

Budget allocation

The envisaged indicative distribution of the €3 billion budget proposed by the Commission of the entire funding period (2021-2027) could be as follows:



During the current Connecting Europe Facility ('CEF') the Commission has successfully mobilized additional investments into digital infrastructures with the Connecting Europe Broadband Fund (the 'CEBF') launched in 2018. If supported by Member States, the Commission services would, also for the next programming period, consider using CEF2 Digital in cooperation with the European Investment Bank and/or National Promotional & Investment Banks ('NPBIs') or their networks of investors, including with blending facilities to mobilize additional sources of capital to support more CEF2 Digital projects in Member States.

4. General implementation rules

The Commission will implement CEF2 in direct management, in close cooperation with an executive agency[17], or indirect management[18], in accordance with the Financial Regulation[19]. In CEF2 Digital, there is no national allocation of funds, except for voluntary transfers[20]; projects have to compete on a fair and transparent basis. However, in line with the CEF2 common understanding, the Commission will aim to ensure that the budget is spread evenly across Member States and contributes to a balance between rural and urban areas.

CEF2 will be implemented via calls for proposals scheduled in the work programme adopted by the Commission assisted by the CEF Coordination Committee, under the examination procedure. The Commission will publish the first multiannual work programme in 2020. This will set out a timetable

for calls in the first 3 years of the programme, their topics and indicative budget, and a prospective framework for the entire programming period[21].

The calls for proposals will outline the objectives and priorities to be addressed, expected results, the performance indicators used for monitoring the contribution to objectives and for measuring progress and results, eligibility criteria, selection and award criteria, the maximum co-financing rate, a schedule of calls and the indicative amounts available[22].

Projects submitted by private or public entities will require the approval of the Member State concerned, except where a Member State explicitly decides otherwise[23]. Member States have a key role in ensuring compliance with the applicable rules.

Projects will be selected through an EU-level competitive evaluation procedure, including for voluntary transfers from EU funds under shared management (e.g. structural funds) to the CEF2 programme (which have to be used for the benefit of the Member State concerned). The Commission will select projects of common interest and determine the estimated total eligible costs and the rate and limit of financial assistance.

For actions funded under CEF2 Digital, the amount of EU financial assistance must not exceed the following maximum co-financing rates[24]:

- with regard to grants for studies, up to 50% of the eligible costs;
- with regard to grants for works, up to 30% of the eligible costs, except for actions:
    - with a strong cross-border dimension, such as uninterrupted 5G system coverage along major transport paths or deployment of backbone networks between Member States or between the EU and third countries, where the rate can be up to 50%;
    - implementing SED Gigabit connectivity, where the rate can be up to 75%;
    - providing free-of-charge local wireless connectivity in local communities using low-value grants (up to €60 000), where the rate can be up to 100% of eligible costs, without prejudice to the principle of co-financing;
- for projects allowing synergies between transport, energy and digital sectors, the co-financing rate otherwise applicable may be increased by 10%; and
- for projects in the outermost regions, the co-financing rate can be up to 70%.

Blending calls will allow for the selection of actions that combine CEF support with financing from InvestEU, the European Investment Bank (EIB), national promotional banks or private sector investors, on the basis of projects' financial readiness.

CEF2 will provide funding in the form of grants (e.g. works relating to CEF2 Digital actions) and procurement (e.g. purchasing technical and administrative assistance, studies, etc.).

Up to 1% of the CEF2 envelope may be used for technical and administrative assistance, *inter alia* to support the preparation of projects in the Member States. As CEF2 Digital is a novel programme for the sector, Member States might be interested in this possibility.

5. Feedback

The Commission invites stakeholders to send comments and/or suggestions regarding the indicative funding actions under the new CEF 2 Digital programme as described in this non-paper and its technical annex to:

EC-CEF2DIGITAL@ec.europa.eu

Stakeholders who want to propose potential infrastructure projects that could receive CEF2 Digital funding are invited also to inform the broadband competence office in their Member State:

https://ec.europa.eu/digital-single-market/en/bco-network-directory

Technical Annex:

Stakeholder responses and indicative funding actions

The below described indicative CEF2 Digital funding actions and their draft implementation orientations, presented for discussion, are based on the preliminary outcome of the CEF2 support study[25] and the online public consultation[26] (3 July to 11 September 2019), to which 76 stakeholders responded, including 42 organisations (academic/research, business associations, companies, NGOs), 15 public authorities, 11 private individuals and 8 'other' respondents.

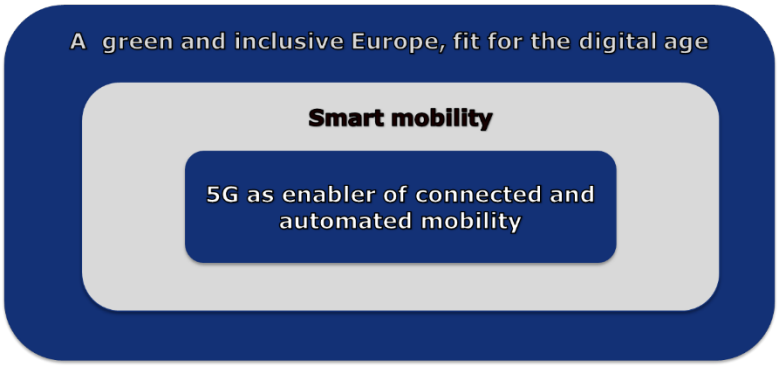
The potential funding actions presented below are based on the partial provisional agreement ('the CEF2 common understanding'[27]) reached in March 2019 between the European Parliament and the Council, in particular on the basis of Art. 8, 9(4) and Annex V. They do not prejudge the future work programme adopted by the Commission assisted by the CEF Coordination Committee of Member States.

Pillar 1: Deployment of 5G infrastructures in Europe

5G corridors for smart & connected mobility

Due to their ultra-reliability and low latency for the critical exchange of data, 5G networks will help to enhance safety and reduce CO_2 emissions and traffic congestion. In line with the EU's strategic connectivity objectives[28], projects in this area will contribute to smart mobility and thereby also to more sustainable infrastructure and climate action. Also, 5G systems and networks will enable several innovative digital ecosystems beyond the automotive and rail sectors. A positive impact is expected therefore, not only on the competitiveness of the telecom, automotive and rail industries in Europe, but also on other sectors that can be transformed by 5G-related innovation.

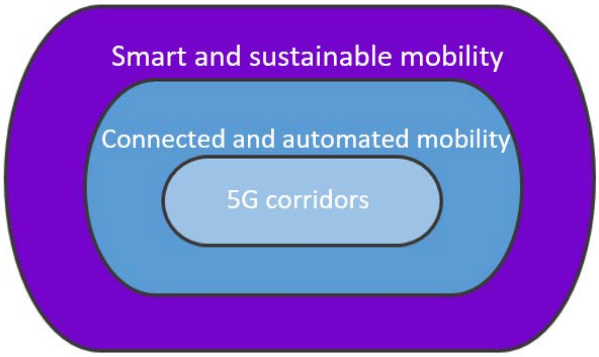
CEF2 Digital would support the roll-out of uninterrupted 5G network and system coverage along major transport routes, including roads, rail and inland waterways, starting with pre-agreed[29] cross-border corridors for CAM. 5G networks and systems are expected to be a major enabler for CAM in Europe, *inter alia* in road, rail, air and waterborne transport.



Since the purely commercial deployment of 5G corridors is not expected to start until 2025, CEF2 Digital would serve to accelerate investment in the EU-wide 5G-based ecosystem. By focusing first on deployments in cross-border areas, including those for CAM experimentation on cross-border corridors as indicated in Annex V, CEF would boost delivery of a sustainable infrastructure and uninterrupted service across Europe. It can also contribute to a competitive Europe, fit for the digital age. The Commission aims at taking account of forward-looking scenarios (e.g. at least 100 Mbps connectivity per car).

It is important to bear in mind that the list of 5G corridors in the Annex V to the draft CEF2 Regulation is indicative and that the Commission services strongly encourage and support the development of further corridors, including along railways and inland waterways.

If concrete synergies can be identified (e.g. with intelligent road signs and/or electricity-charging infrastructures), CEF2 Digital calls on 5G corridors could be closely synchronised with CEF Transport calls relating to digital transport infrastructure, including intelligent transportation system (ITS) services, where appropriate.



Summary of stakeholder views:

The vast majority of respondents to the public consultation (i.e. local, regional and national governments, and stakeholders from the sectors of telecom (vendors and operators), original equipment manufacturers (OEMs), rail and road operators) expressed support for the CEF2 Digital objectives regarding the deployment of 5G corridors. The cross-border sections of corridors are seen as a relevant area on which to focus efforts, while the 700 MHz and 3.4-3.8 GHz bands are seen as the best spectral mix, for different types of use cases (both CAM-related and for the broader ecosystem).

Most respondents consider that CEF funding should be focused on passive infrastructure support rather than active equipment. While respondents are overall relatively cautious as regards project size, many call for a clarification/review of EU state aid guidelines for broadband projects that are subject to coverage obligations under 5G spectrum licence conditions.

Views are mixed as regards the ideal market structure for the provision of 5G connectivity along cross-border corridors. Bigger telecom operators want to avoid unnecessary duplication of resources in economically less viable areas, while ensuring business continuity and redundancy. They would prefer a maximum of one or two operators per area, with roaming/network-sharing agreements with other service providers. Infrastructure users (e.g. service providers, media, rail and IT operators) call for wholesale access and network slicing to enable open and multi-service CAM platforms. Where only one or two networks are economically viable, wholesale access to CEF-funded

infrastructure (via roaming, slicing or other means) could be a viable way of ensuring adequate competition and service innovation.

Potential call conditions for this funding action:

Potential beneficiaries/eligible entities	The beneficiaries will probably be consortia, including mobile network operators, road operators, transport authorities, service providers, equipment manufacturers, etc. CEF2 Digital aims to facilitate the process using various European partnerships and stakeholder fora building on the 5G strategic deployment agenda for CAM[30].
Pre-conditions for participation	For 5G corridors, it is important that beneficiaries demonstrate that certain pre-conditions for successful deployment are met. These include access to transport paths, access to relevant spectrum (directly or contractually through service providers) and reassurances as to the operation of the service beyond the specific section supported by CEF, in view of the long-term development of the pan-European corridor network. Projects will need to demonstrate a level of connectivity and service provision beyond any legally binding 5G coverage obligations attached to spectrum licences that apply to the corridors in question.
Project selection criteria (Articles 8 and 13 of draft CEF2 Regulation)	CEF2 will in the first place fund projects in cross-border sections of major transport paths (as indicated in Part V of the Annex) involving one or more Member State(s). In addition, CEF intends to finance projects in larger corridors including a cross-border section, where there is no relevant 5G network present or planned in the near future. The cross-border sections will be taken into account when considering national segments. CEF2 Digital intends to finance projects that demonstrate uninterrupted coverage, quality of connectivity and a solid implementation plan, including access to services and applications with additional social, economic and environmental benefits, and a commitment to maintaining the infrastructure and providing uninterrupted service beyond the cross-border sections funded. The Commission will pay particular attention to infrastructure projects that support a multi-service/multi-application platform, as a way of creating more value and enhancing service innovation and choice, and to the overall profitability of investment. Priority would be given to projects that provide open wholesale access on a non-discriminatory basis to all operators that hold relevant spectrum licences and other potential relevant service providers in the territory concerned, taking account of the additional levels of risk undertaken by the co-financing beneficiary.

Maximum project size(s), co-financing rate(s) and eligible cost items	CEF2 Digital will allocate grants for up to 50% of the total eligible cost of a project for cross-border sections and up to 30% for any related intra-Member State projects. For larger projects, it should be possible to combine different rates of support, e.g. for cross-border (50%) and non-cross-border sections (30%) of the same transport path. The indicative maximum grant is €50 million for typical projects involving 100-400 km cross-border sections of CAM corridors. The remaining funding, up to the total value of the project, could come from private or public sources; for the latter, the Member State will have to ensure prior state aid compatibility in accordance with the applicable State aid rules. Eligible costs that can be reimbursed from CEF2 Digital grants would cover: • Investment costs of physical works[31] for the deployment of optical fibre elements necessary for 5G networks; and • Investment costs of physical works for the construction of transmission towers.
Indicative timetable of CEF2 Digital calls (types and dates)	2021: studies for major corridors 2022-2024: first wave of calls for proposals; review and studies for second wave of calls 2024-2027: second wave of calls for proposals

Potential complementary EU support:

Further support for 5G corridor infrastructure could be provided via InvestEU, by means of guarantees and, possibly, an equity product to support investments exposed to greater profitability risk. Also, complementary ERDF investments might be necessary to complete cross-border sections and deliver pan-European corridors. The DEP could support the deployment of 5G services, such as cybersecurity applications and cloud-based applications for connected vehicles, while Horizon Europe can help to fund research in 5G networks and services. An effort will be made to streamline the timing of the calls for proposals.

5G communities – Gigabit connectivity for socio-economic drivers and citizens

In efforts to make the EU 5G-ready, a significant investment gap remains between the funding needed to achieve Gigabit connectivity targets and projected public and private investments. Areas of market failure persist across the EU and there are big differences between regions as regards the level of funding needed.

In fact, a majority of the NUTS3[32] regions in the EU that are subject to market failure, show only a limited degree of market failure which can be addressed using low intensity grants. In such areas, support from CEF2 Digital can kick-start projects and trigger co-investments for quick and resource-efficient network deployments (see SMART 2017/0018[33], section 2.4). CEF2 Digital would not only support Gigabit infrastructures in those areas/communities, but also enable them to take **full part in a competitive Europe, fit for the digital age**, by addressing crucial bottlenecks in digital transformation and the realisation of digital potential.

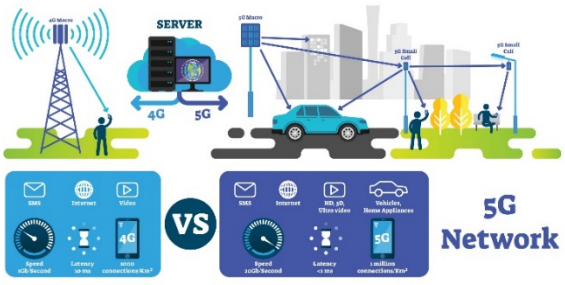
CEF2 Digital would prioritise to accelerate and complement private investments in very high capacity, including 5G, networks in such areas where socio-economic drivers ('SEDs'), with priority hospitals, medical centres, education and research centres, are located[34] and where no such network currently exist, or is planned in the near future. **Comprehensive deployment projects** would thus build energy-efficient Gigabit infrastructures to connect all SEDs and households in the target area, to make digital services, including innovative 5G applications, available across Europe.

In addition, CEF2 Digital can support the **efficient**[35] **stand-alone deployment** of Gigabit networks to priority SEDs in regions with more severe market failure, e.g. where the comprehensive deployments would require a much higher level of public support. Such projects could aim to construct backhaul networks connecting SEDs with Gigabit networks which should also facilitate access to modern 5G wireless services and possibly, over time, fibre-line services to surrounding communities. Calls could be organised for Member States planning such more focused projects earlier than those for comprehensive projects, in order to exploit the leverage effect of the stand-alone investments for further private investments in the surrounding areas.

In all the above cases, the objective of CEF2 Digital would be to provide grant support for projects that maximise private investments in very high capacity networks, while ensuring that Gigabit networks are rolled out as comprehensively as possible and can be used directly to provide digital services and applications.

Summary of stakeholder views:

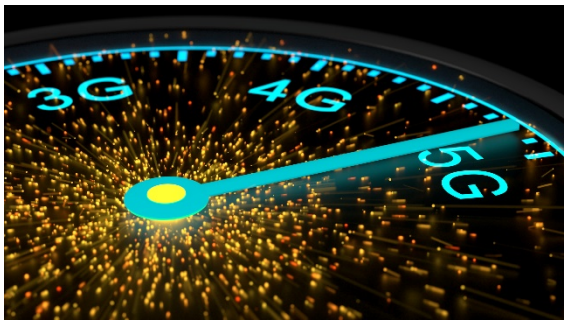
Stakeholders widely acknowledge the need for such projects, provided there is no crowding-out of private investments and no overlap with existing instruments. Among the specific CEF2 Digital actions, **5G communities** attracted the interest of most respondents to the public consultation (51%), with over 75% agreeing with the need for EU financial support in such areas.



The SEDs suggested by most respondents for prioritisation were public authority buildings, business and industrial parks, incubators and SMEs, transport hubs (ports and airports) and urban transport corridors, tourist and cultural sites, and other sites of public interest, such as libraries and leisure centres. These were suggested in view of their multiplier effects, but also in view of use cases with high expected value, e.g. impact of 5G on public services, culture and tourism, urban and green mobility, and digitalising (in particular rural) industry and agriculture.

Most respondents called for CEF2 Digital intervention to focus on rural areas, including communities with few SEDs but where the socio-economic value of Gigabit connectivity is high, due to greater reliance on online services. Also, most pointed to synergies between SED and household deployments, and felt that stand-alone deployments should be supported only exceptionally (e.g. where use cases and multiplier effects justify it; when an SED is geographically isolated, etc.).

Several stakeholders stressed the need to ensure that CEF2 Digital does not crowd out private investment or distort the market, as any unwanted effects on competition would be passed on, not only directly to telecom consumers, but also to all sectors in which 5G networks are expected to have a big impact. The stakeholders suggested several means of ensuring this:



– typical broadband state aid safeguards, e.g. market consultation and mapping to confirm that the intervention is confined to underserved areas;

– collaborative tendering and partnerships with local stakeholders; and

– open access, technological neutrality and interoperability.

Various respondents commented on project implementation, in particular ideal project size, with some calling for smaller projects in order to facilitate the involvement of local stakeholders and show clear outputs and demonstration effects, and others arguing for 'more efficient' larger projects. A preference was expressed for funding models that had proven successful in other public funding programmes, such as the funding gap model. No single business model commanded the support of a majority of respondents.

Potential call conditions for this funding action:

Potential beneficiaries/eligible entities	Private and/or public entities are eligible to propose projects in areas where no network exists or where the development of networks is not planned in the near future by private operators or other public interventions.
Pre-conditions for participation	Member States will have to ensure that projects do not overlap with other public support schemes and do not involve deploying Gigabit networks in areas where such a network already exists (or is planned in the next 24 months), e.g. on the basis of existing broadband mapping exercises. Stand-alone projects deploying networks solely to connect SEDs will have

	to demonstrate that the SEDs will use the infrastructure and that deployment over a wider area is not financially viable under current conditions.
Project selection criteria (Articles 8 and 13 of draft CEF2 Regulation)	Calls will seek to fund resource-efficient comprehensive deployment projects that maximise coverage of households and SEDs, prioritising hospitals and medical centres, education and research centres, with Gigabit networks, in areas where no such networks exist (or are planned in the next 24 months). With stand-alone deployment projects targeting SEDs only, the digital services and applications that the SEDs can use to the benefit of their surrounding communities will be taken into account. Applicants will have to demonstrate that the SEDs will use the infrastructure. All projects will have to demonstrate synergies for the (future) comprehensive coverage of the relevant area with 5G wireless networks, including appropriate open and non-discriminatory wholesale access conditions.
Maximum project size(s), co-financing rate(s) and eligible cost items	CEF2 Digital will allocate grants for up to 30% of the total eligible cost of projects to connect households and up to 75% for projects connecting SEDs[36]. For combined projects, the overall rate could be calculated on the basis of the numbers of connected households and SEDs, subject to appropriate weighting. The indicative maximum grant is €60 million for comprehensive deployment (SEDs and households) projects and €20 million for stand-alone (Gigabit to SEDs-only) projects. The remaining funding, up to the total value of the project, could come from private or public sources; for the latter, the Member State will have to ensure prior state aid compatibility in accordance with the applicable State aid rules. Eligible costs that can be reimbursed from CEF grants would cover: • Investment costs of physical works[31] for the deployment of optical fibre elements to the targeted entities (SEDs and households, or SEDs only, and mobile base stations).
Indicative timetable of CEF2 Digital calls (types and dates)	2021: - studies for project preparation for comprehensive deployment projects - [launch of funding instruments in cooperation with EIB or National Promotional banks TBC] - first wave of calls for proposals for stand-alone deployments to SEDs 2022-2024: - calls for proposals for comprehensive deployment projects

Potential complementary EU support:

Further support for connectivity deployments can be provided via InvestEU for commercially viable projects, and via structural funds. The ERDF could complement network roll-outs in areas with more severe market failure and fund the deployment of digital applications and services in areas where digital connectivity infrastructure is funded by CEF. Also, synergies would be sought with the services and applications funded by the DEP (e.g. e-health, e-learning, e-government), via coordinated calls for proposals.

5G services for smart communities ("5G4EU" projects)

Experience from the successful WiFi4EU initiative demonstrates that there is significant demand from municipalities and regions across the EU for better wireless connectivity. At the same time, many areas, including rural ones, have benefited – or will benefit in the next MFF – from privately or publicly funded fibre network deployments. It is also becoming increasingly clear that 5G networks will be indispensable for well-functioning smart community applications and services.

However, while such 'use cases' often based on bottom-up demand can stimulate local digital transformation, they do not always support the business case for upgrading mobile networks to 5G where needed. CEF2 Digital could be implemented to enable user communities (e.g. municipalities) to contract operators to upgrade their networks so that they support new 5G-based applications and services, e.g. to implement new bandwidth-intensive services and related business models.

By supporting very high quality wireless connectivity for local communities, CEF2 Digital would aim to stimulate comprehensive deployment and use of digital services across Europe, and further network roll-out by raising awareness and stimulating demand. It would thereby accelerate the roll-out of 5G networks in rural areas and areas at high risk of not being served by the market in the medium term. This would require supporting the installation of, or upgrade to, a 5G network in areas where the necessary fibre backhaul capacity is already available, in order to contribute to the availability of 5G and other state-of-art connectivity for socio-economic drivers, as well as to the uninterrupted 5G wireless broadband coverage of all urban areas by 2025.

For such "5G4EU" projects that provide access to deployment sites and existing fibre backhaul, CEF2 Digital would fund the public contribution for the deployment of wireless infrastructures to provide 5G services.

Communities would be able to work with any operator(s) with relevant spectrum access to provide the 5G-based service that they are interested in. Using existing fibre backhaul to connect small area wireless access points ('small cells'), for example, the operator could use the same infrastructure to launch additional smart 5G services to other users in the area. Implementing such a 5G4EU programme would be considered as a 'next-generation WiFi4EU' support for municipalities and regions across the EU for better wireless connectivity, after the final call of the current WiFi4EU programme[37] in 2020.

Summary of stakeholder views:

Regarding the Wifi4EU initiative, most stakeholders point to the benefits of involving local/regional decision makers in such projects, both for facilitating the roll out but also for identifying concrete applications and needs. Building on the connectivity demand for WiFi4EU, CEF2 Digital could fund '5G4EU' projects that provide communities with 5G services for innovative applications. However, a number of stakeholders also consider that WiFi4EU does not specifically address rural areas, or at

least, there is not a clear priority to target these areas. Some consider that requirements for the network setup are complex and unclear, especially for the smallest municipalities. For some municipalities national procurement laws are considered an obstacle.

During the CEF2 Digital workshops in several Member States, the concept of 5G smart communities and 5G4EU projects have triggered huge interest from the majority of stakeholders. Many notably see it as means to bring 5G coverage to potential use cases that start from local and regional needs. Moreover, the fibre pre-requisite for 5G networks seems to be widely accepted.

For both of these initiatives, the vast majority of respondents want to include, in addition to traditional strategic areas, business parks, enterprises with high added value, transport hubs, leisure areas, as well as public administrations related to e-Government, with a particular focus on rural areas.

Potential call conditions for this funding action:

Potential beneficiaries/eligible entities	Local authorities may contract with mobile network operators or neutral host small cell operators, to be selected via a competitive selection process. CEF2 intends to finance projects which ensure the required elements for the functioning of a 5G network (e.g. access to street furniture, permits, backhaul, radio spectrum, etc.) are already available.
Pre-conditions for participation	"5G4EU" projects will have to demonstrate that access to the necessary fibre backhaul capacity and the relevant deployment locations is contractually ensured. They will have to demonstrate that the co-financed 5G network will provide the requested 5G digital services/applications for at least 10 years and will cover all SEDs in the relevant area with 5G wireless broadband coverage.
Project selection criteria (Articles 8 and 13 of draft CEF2 Regulation)	CEF2 Digital will fund resource-efficient projects to contribute to the deployment of the infrastructures needed to provide 5G-based services in areas where the physical backhaul pre-conditions are met, but where a 5G network for the provision of specific digital services/applications is not currently in place or planned in the near future. CEF2 Digital intends to only finance projects which do not duplicate existing free private or public offers of similar characteristics, including quality, in the same public space. Priority will be given to "5G4EU" projects that maximise household and SED 5G coverage and aim to leverage strategic EU data infrastructures (e.g. those funded by the DEP) to bring digital services to SEDs.
Maximum project size(s), co-financing rate(s) and eligible cost items	CEF2 Digital will allocate grants for up to 30% of the total eligible cost of resource-efficient "5G4EU" projects for the upgrade of infrastructure needed to provide 5G-based services. The indicative grant size is 60k/200k up to 1 million Euro. The remaining

	funding, up to the total value of the project, should come from the future 5G network operator. Eligible costs that can be reimbursed from the CEF grants would cover: • Investment costs of physical works[31] for installation/upgrade to a 5G network.
Indicative timetable of CEF2 Digital calls (types and dates)	2020: Invitations for preliminary expressions of interest in 5G4EU projects to assess demand [‘next-generation WiFi4EU’]. 2021-2025: annual calls subject to pending demand and lack of 5G coverage in MS

Potential complementary EU support:

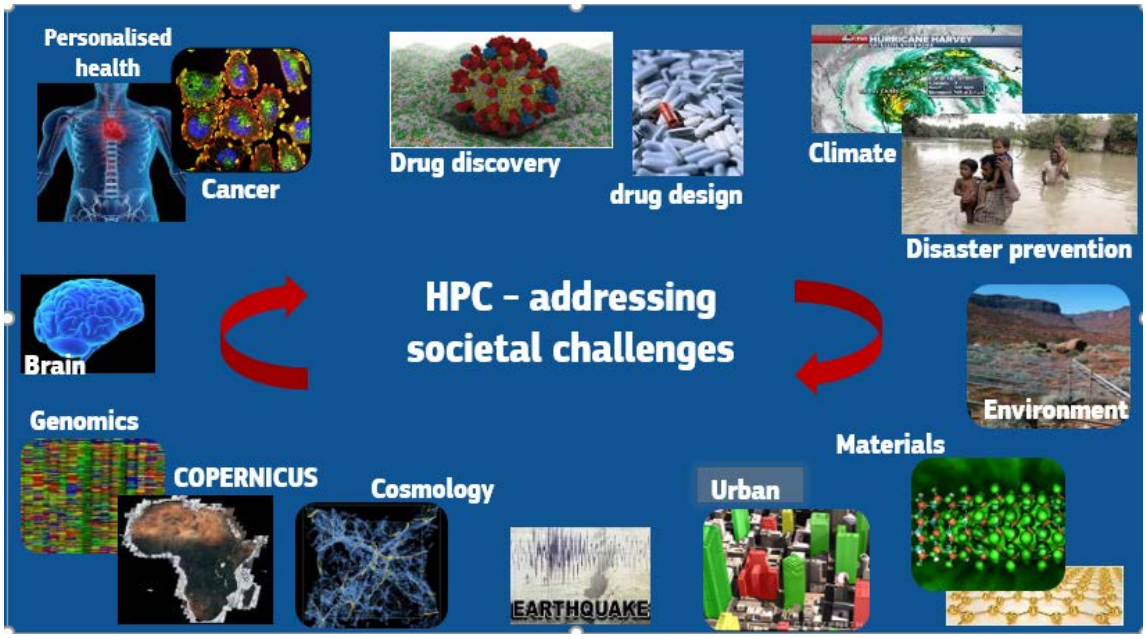
Synergies will be available with various services and applications that have been developed using EU and/or national funds and that will continue to be deployed via the DEP (e.g. e-health, eLearning), possibly via coordinated calls for proposals.

Pillar 2: EU cross-border data infrastructures

Strategic terabit connectivity for HPC

Under the EuroHPC joint undertaking[38], the EU and 20 participating states are investing over €830 million in 2019 and 2020 to acquire, build and deploy an integrated world-class HPC (High-Performance Computing) and data infrastructure[39]. By the end of 2020, the joint undertaking is expected to deploy a pan-European supercomputing infrastructure composed of three supercomputers among the top 10 in the world and at least five others that would rank in the world's top 50 today. In 2022-2025, it plans to invest in two more top-range supercomputers and several other mid-range supercomputers.

Supercomputing is a critical tool for addressing complex societal challenges. For example, predicting the impact of severe weather conditions (size and paths of storms and floods) is key to being able to activate early warning systems and thus save human lives and reduce damage to property and public infrastructure. Supercomputing is also instrumental in the discovery of new drugs and developing targeted medical therapies for patients affected by cancer, Alzheimer's, cardiovascular diseases and rare genetic disorders.



HPC and big-data analysis enable innovation in industry and business, by significantly reducing product design and production cycles, accelerating the design of new materials, increasing resource efficiency and optimising decision-making processes. As a result, traditional sectors become more productive and scale up to higher-value products and services, reducing the environmental footprint of industry and society at large.

One of the main goals of the joint undertaking is to create a genuinely pan-European HPC and data infrastructure that operates in federated mode and allows users to benefit from its services regardless of their location in Europe. This will enable citizens, public authorities, scientists and industry to benefit from the investments in supercomputers and the data economy[40]. However, in order to cope with the massive amounts of data transfer and to offer non-discriminatory access to

users (regardless of their location), significant investments are needed in capacity and secure-access enablement services.

While fibre infrastructure is widely available in the EU from commercial operators and utilities, the joint undertaking will increase demand for high bandwidth and HPC services (up to terabit level), highlighting market failure, as commercial service providers do not currently have the operational capacity to offer the level of service required for full decentralised exploitation of HPC resources.

A virtuous link will be developed between HPC and the European open science cloud (EOSC), as an upgraded HPC connectivity service will make the EOSC services more accessible and the EOSC, which has a mandate to enlarge its user base beyond scientists and researchers, will make HPC services in Europe accessible through many new channels.

GÉANT[41] and the national research and education networks (NRENs) currently provide most of the connectivity services that HPC centres require today. GÉANT and the NREN federation group demand and procure raw capacity from commercial providers (optimising the use of resources at EU and national level). This allows them to build added-value services for higher education institutes, research centres and universities that commercial providers cannot match.

CEF2 Digital could support and substantially improve the cross-border connectivity and service provisioning between identified nodes of the pan-European HPC infrastructure. This would improve the access services available to EU scientists, public authorities and industry, and national access infrastructures. CEF2 Digital could build on existing (and projected) GÉANT and NREN federation network infrastructure, investing primarily in equipment and installation costs, and optimising EU and Member State investments.

Summary of stakeholder views:

The public consultation highlighted two different approaches to addressing the HPC connectivity challenge:

- a public 'overlay' network on top of new investments in the GÉANT/NREN backbones; and
- deployment of a new, state-of-the-art network, purpose-built with European technology and linked to a European public cloud service offer.

Some respondents favour a 'carrier-neutral' approach to trans-European networks, ensuring connections in a seamless and efficient way, e.g. by means of a photonic switching architecture. The aim would be to optimise the number of inter-carrier interconnections and develop a highly competitive infrastructure able to ensure low price routes and enabling a whole new HPC service market. Attention should be paid not only to capacity (up to terabit connectivity), but also ultra-fast services with minimal latency.

National and local segments of the HPC network are also considered important (e.g. in connecting SME parks with HPC service providers), in order to deploy services that rely on very demanding computing capabilities. The attractiveness of the new HPC infrastructure and ecosystem could be further enhanced by adequate international connectivity (e.g. sub-sea cables), particularly in remote areas seeking to benefit from HPC capabilities.

Stakeholder recommend that public support could take the form of initial funding (e.g. direct grants) and guaranteed minimum turnover (anchor customer), since no terabit service is yet available in Europe. Clarity would be needed as to how and on what conditions anchor customers would be guaranteed.

Some respondents argued that the use of public funds for new optical fibre deployments should be avoided, as (in their view) plenty of available fibre is not yet used, so such action would distort the market.

In the light of the above and the preliminary outcome of the CEF2 support study[42], the recommended CEF2 action should favour upgrade investments on top of existing (and projected) network infrastructures to reach the required level of service for HPC connectivity.

Potential call conditions for this funding action:

Potential beneficiaries/eligible entities	GÉANT, the NRENs and telecom provider consortia. The EuroHPC joint undertaking would be responsible for managing the calls and the budgets.
Pre-conditions for participation	Project promoters will need to demonstrate unmet capacity needs, e.g. by unsuccessful calls for tender, and seek the agreement of the Member States concerned as required for CEF2 projects. CEF2 intends to finance infrastructure projects which guarantee open and non-discriminatory wholesale access to the supported network infrastructure.
Project selection criteria (Articles 8 and 13 of draft CEF2 Regulation)	CEF2 will seek to fund cross-border projects to roll-out backbone infrastructures for HPC that are not provided on the market, to support access to key digital, (in particular HPC) capabilities, EU competitiveness in the digital economy, data sovereignty, scientific and industrial leadership, etc.
Maximum project size(s), co-financing rate(s) and eligible	CEF2 will allocate grants for: • up to 50% for cross-border deployments; and • up to 30% for national sections of cross-border deployments.

cost items	The indicative grant size is likely to be €25-75 million, depending on coverage. The remaining funding, up to the total value of the project, may come from private or public sources; for the latter, the Member State will have to ensure prior state aid compatibility in accordance with the applicable State aid rules. Eligible costs that can be reimbursed from the CEF grants would cover: • Investment costs of physical works[31] for deployment of new backbone networks; • Investment costs of equipment necessary for a significant and sufficient capacity upgrade of existing backbone networks • Capital expenditure for service activation if additional to investment costs of physical works for deployment of new backbone networks.
Indicative timetable of CEF2 Digital calls (types and dates)	2021 (or 2022 at the latest): first call for proposals

Potential complementary EU support:

The ERDF could provide complementary support for national deployments, provided no relevant backbone network is already in place.

Strategic backbone networks for cross-border and sustainable cloud federations

The adoption of new foreign laws[43], economic actors' tight budgetary constraints, growing awareness of cloud impacts on climate change, relatively low (18%)[44] and geographically fragmented EU cloud uptake and the need to enable the free flow of data – these factors are all fuelling demand for a new type of cloud infrastructure. This is reinforced by the fact that cloud is the key technology underpinning the fast and competitive uptake of emerging technologies (e.g. AI, blockchain, IoT and HPC) and, ultimately, technological sovereignty.

The new public and private demand is characterised by a need for cloud infrastructures that are entirely secured, interoperable, interconnected in an environmentally sustainable manner, enable portability and operate on a large scale and at high speed across the EU internal market (c.f. the launch of the Gaia-X cloud initiative[45]). To respond effectively while remaining competitive, the new type of cloud infrastructure 'as a product' needs at least to:

- cope with the latest digital challenges, in particular enabling:
    - the industrial processing of large amounts of data in HPCs;
    - swift uptake of AI applications; and
    - the operationalisation of data spaces;
- respond dynamically to sectoral users' needs, by
    - providing data processing and storage capacities across the EU at high speed, with low latency and in an energy-efficient manner;
    - leveraging ultra-fast backbone connectivity; and
    - meeting EU data-protection, security, portability and energy-efficiency requirements; and
- overcome the current low, geographically and sectorally fragmented cloud uptake across the EU due to cloud infrastructures being largely located in a few large cities where energy costs are low and high-speed networks are available.

However, individual economic operators are currently unable to supply a new type of cloud infrastructure 'as a product' with these characteristics. This is due in particular to a lack of scale, limited geographical presence, pricing, investment, technical limitations, unequal access to high-speed backbone connectivity across the EU and failure to meet all data-protection, security, portability and energy-efficiency requirements. As a result, the new demand is largely unmet, thus limiting users' choices across the internal market. Today the market fails to supply cloud infrastructures that effectively respond to the new European industrial and governmental demand/needs for data processing and storage capacities fulfilling all European requirements of data protection, security, access, portability and energy efficiency. In particular public administrations and SMEs are not be able to fully leverage the potential of interconnected cloud infrastructures to ultimately deliver better public services to the common interest of the European society and economy. By supporting co-investment in energy efficient equipment CEF2 Digital can contribute to EU cloud infrastructures becoming more energy efficient[46].

Therefore, CEF2 Digital could be the EU's main instrument to strategically and gradually to co-invest in secure, sustainable, interoperable, cross-border and high-speed cloud infrastructure interconnections, first of all among:

- the cloud infrastructures of SEDs[47]; and
- operators provisioning cloud infrastructures (e.g. cloud providers, telecoms operators).

Secondly, it is proposed that CEF2 investments be used at a later stage:

- to connect other operators' cloud infrastructures that provide services of general interest[48]; and
- to ensure wider interconnections with the EOSC and the network of pre-exascale HPC.

Thus, CEF2 Digital could be used to prioritise co-financing of essential cross-border interconnections of cloud infrastructures among all types of entities and the associated interoperability, data privacy, security and energy-efficient aspects across the EU. Consideration could also be given to synergies with other CEF2 Digital actions supporting strategic terabit connectivity for HPC and with DEP actions, in particular the 'cloud federation as a service' initiative aimed at financing the large-scale deployment of cross-border cloud-based services for public administrations, hospitals and other operators.

Summary of stakeholder views:

In the public consultation, a large majority of respondents (private individuals, businesses and public administrations) supported the idea of establishing federations of interconnected cloud infrastructures across the EU to create economies of scale and energy-efficient data flows, and to ensure access to cloud services for users across the internal market.

It was also highlighted that establishing cloud infrastructure interconnections requires investment in service and platform interoperability. The fostering of environmental sustainability is an essential 'key performance indicator' of an action's success. One respondent questioned the need for further investment under CEF2 for the deployment of high-speed networks across the EU, given that such networks already exist. However, the contacts with stakeholders highlighted that current networks, in particular for ultra-fast backbone connectivity, do not satisfy cross-border operators' needs, in particular as regards latency.

One respondent raised the possibility of merging the 'strategic terabyte connectivity for HPC' and 'strategic backbones for cross-border and sustainable cloud federations' actions. It is true that synergies can be supported by concentrating CEF2 investment in resilient, mature and essential cross-border interconnections of cloud infrastructures, on the one hand, and of HPC on the other, to meet the diverse needs of current constituencies. Interconnecting networks would thus be useful in fostering the emergence of new types of computing service, such as 'HPC as a service' for industrial use.

Potential call conditions for this funding action:

Potential beneficiaries/eligible entities	The beneficiaries will probably be consortia of public administrations, cities, hospitals, cloud infrastructure and service providers, telecom, software and other companies (including SMEs), organisations providing services of general interest, system integration companies, wire, cable and backbone carriers, and manufacturers.
Pre-conditions for participation	Projects will have to establish interoperable, sustainable and secured cloud infrastructure interconnections that are vendor-neutral, enable portability and could offer multi-sector usages. The data stored and transported between two interconnected cloud infrastructures cannot be accessible, stored and shared by any third country. Data transport and flows must be secured and kept in the EU and be energy-efficient. Proposals need to show that they meet the data-protection, security, portability and energy-efficiency requirements applicable to data-processing/storage services and activities developed under the relevant European codes of conduct, initiatives and legislation.
Project selection criteria (Articles 8 and 13 of draft CEF2 Regulation)	Each project needs to: - cover at least three entities operating in the EU; - achieve an energy-efficiency gain in data transport and/or cloud infrastructure interconnections; and - demonstrate the potential to foster greater cloud uptake among the interconnected entities by the end of the project period.
Maximum project size(s), co-financing rate(s) and eligible cost items	CEF2 Digital will allocate grants for: • up to 30% of the total eligible costs for national deployments; and • up to 50% for cross-border deployment The indicative maximum grant for each project is €10-25 million. The remaining funding, up to the total value of the project, could come from private or public sources; for the latter, the Member State will have to ensure prior state aid compatibility in accordance with the applicable state aid rules. Eligible costs should cover equipment, facilities and works costs, when treated as capital expenditure by the beneficiary: • Investment costs for deployment of high-speed networks and associated physical works (for physical interconnection of cloud infrastructures); • Investment costs of deployment of software and associated interoperability, cybersecurity and data-privacy aspects (for functional interconnections of cloud infrastructures); and • Investment costs of equipment and software relating to the reduction of the energy footprint of cloud interconnections

	and/or data transport and flows.
Indicative timetable of CEF2 Digital calls (types and dates)	2021–2022: 1st phase: - calls to build cross-border, secured, interoperable and energy-efficient interconnections of SED cloud infrastructures; and - calls to build cross-border, secured, interoperable and energy-efficient interconnections of cloud infrastructures of operators providing cloud infrastructure services in the EU. 2023–2024: 2nd phase: - calls to expand cross-border, secured, interoperable and energy-efficient interconnections of SED cloud infrastructures; - calls to expand cross-border, secured, interoperable and energy-efficient interconnections of cloud infrastructures of operators providing cloud infrastructure services in the EU; and - calls to build cross-border, secured, interoperable and energy-efficient interconnections of cloud infrastructures of economic entities operating in at least one strategic economic sector in the EU.

Potential complementary EU support:

The DEP will fund the deployment of pan-European cloud-based services. CEF2 Digital and DEP calls should be coordinated in the deployment phase (calls to be published as of 2021), to enable swift provision of public and economic services of general interest across the EU.

Submarine connectivity of strategic importance

Submarine cables play an essential role in ensuring high-capacity and high-performance (in terms of resilience, security, redundancy and latency) digital connectivity throughout the EU, in particular for islands or states with long coastlines, the outermost regions, and overseas countries and territories (OCTs). They are also crucial in providing the efficient international connectivity that is of such strategic importance in linking the EU with its trading and research partners around the globe.

The capacity and resilience of the overall network infrastructure benefit all participants (even landlocked Member States benefit from international connectivity and contribute to the traffic routed via international submarine cable systems). It is therefore necessary for the EU to secure the competitive availability, reliability and resilience of such vital infrastructures. In particular, EU support is needed to fill market gaps by means of specific projects.

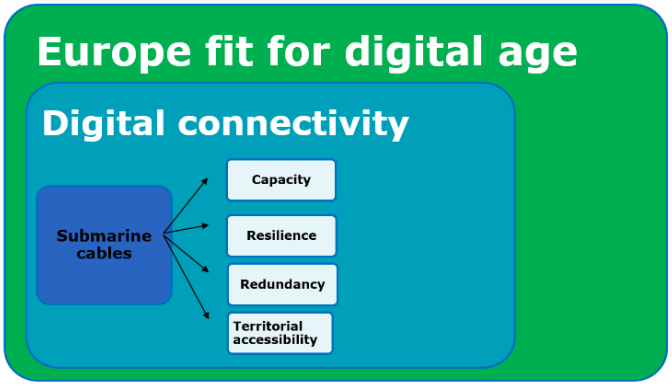
By supporting the targeted deployment of such cables, CEF2 Digital could have a positive impact not only on capacity, but also on commercial offers of connectivity throughout the EU. It would aim to address market failure by:

- improving the reliability and resilience of existing backbone infrastructures to guarantee for international connectivity throughout the EU by deploying a separate route that can ensure adequately safe and secure connectivity for the Gigabit society.
- deploying new submarine cables for certain routes (within the EU, and between the EU and other countries), including to remote territories, where a lack of capacity deprives citizens and businesses of access to Gigabit connectivity at competitive prices.

CEF2 Digital would only support the deployment and/or significant upgrade of submarine cables, for which the market alone will not invest, because such an investment would not be privately profitable, i.e. where no relevant infrastructure of the same characteristics exists or is planned in the near future.

In addition, for submarine cables within Member States, eligible projects would be only those that, as a minimum (i) address a market failure which cannot be solved by regulatory measures, (ii) without crowding-out private investments or unduly distorting competition.

Synergies could be leveraged, in particular with energy interconnector projects as well as international interconnection projects.



Summary of stakeholder views:

Contacts with stakeholders and the results of the public consultation underline a number of strategic challenges, in particular facing EU islands that are connected only to one (other) Member State or to/via a third country and are concerned about prices offered and vulnerability.

In addition, the trend of huge investments in deploying or purchasing subsea cables to interconnect proprietary data centres, without selling capacity to other players in line with the traditional model in the sector, is worrying for territories that rely on limited redundancy. Prices offered throughout the EU differ generally, but this is particularly challenging for the outermost regions and the OCTs.

The public consultation confirmed and underlined this message. Respondents called for a focus on:

- connecting remote territories;
- reducing prices through increased competition, latency, resilience, redundancy; and
- interconnecting regional networks.

Submarine cables are seen by many as the superior technology, even where terrestrial alternatives exist. Respondents expressed concern as to the vulnerability of this critical infrastructure and one mentioned the need to accelerate permit procedures in the Member States, in particular for the routing and landing of submarine cables.

Potential call conditions for this funding action:

Potential beneficiaries/eligible entities	National authorities and commercial actors, including sector-specific consortia.
Pre-conditions for participation	Project promoters would have to demonstrate a need for public support (not covered by market investors) to: - Improve the reliability and resilience of existing backbone infrastructures; or - Deploy new submarine cables (in the EU, or between the EU and non-EU countries) to address capacity/redundancy shortfalls depriving EU citizens and economic actors of access to Gigabit connectivity at competitive prices.
Project selection criteria (Articles 8 and 13 of draft CEF2 Regulation)	CEF2 Digital would prioritise projects of geo-strategic importance for the EU as a whole and projects that will ensure previously unavailable cross-border network integration or territorial accessibility.
Maximum project size(s), co-financing rate(s) and eligible cost items	CEF2 Digital would allocate grants for up to 50% of the total eligible project cost for cross-border cables. Projects in outermost regions qualify for co-financing of up to 70%. The indicative maximum grant for projects is €25 million. The remaining funding, up to the total value of the project, could come from private or

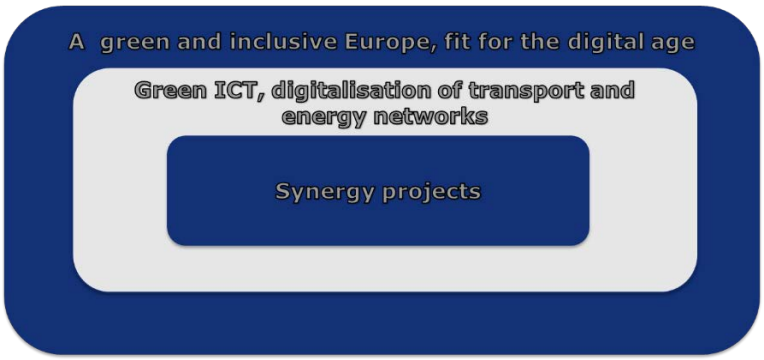
	public sources; for the latter, the Member State will have to ensure prior state aid compatibility in accordance with the applicable State aid rules. Eligible costs that can be reimbursed from the CEF grants would cover: • Investment costs related to physical works[31] for deployment of new submarine cables; and • Investment costs of equipment needed for upgrading existing submarine cables.
Indicative timetable of CEF2 Digital calls (types and dates)	2021: studies for project preparation 2023-2024: call for proposals

Potential complementary EU support:

InvestEU can fund commercial deployments of submarine cables. ERDF investments are not excluded, but not common.

Operational digital platforms and synergy projects

Future needs for the decarbonisation and digitalisation of the EU economy will involve convergence of the energy, transport and digital sectors. CEF2 Digital aims to fund the operational digital platforms that are needed to leverage such synergies, in areas such as cross-border cooperation on renewable energy and data centres, energy storage and smart grids, and CAM.



In addition to potential synergy work programmes with the other sectors of CEF2 or synergetic elements within projects of the other sectors, CEF2 Digital could support platforms that provide the necessary infrastructure to ensure the cross-border availability of digital services in the energy and transport networks.

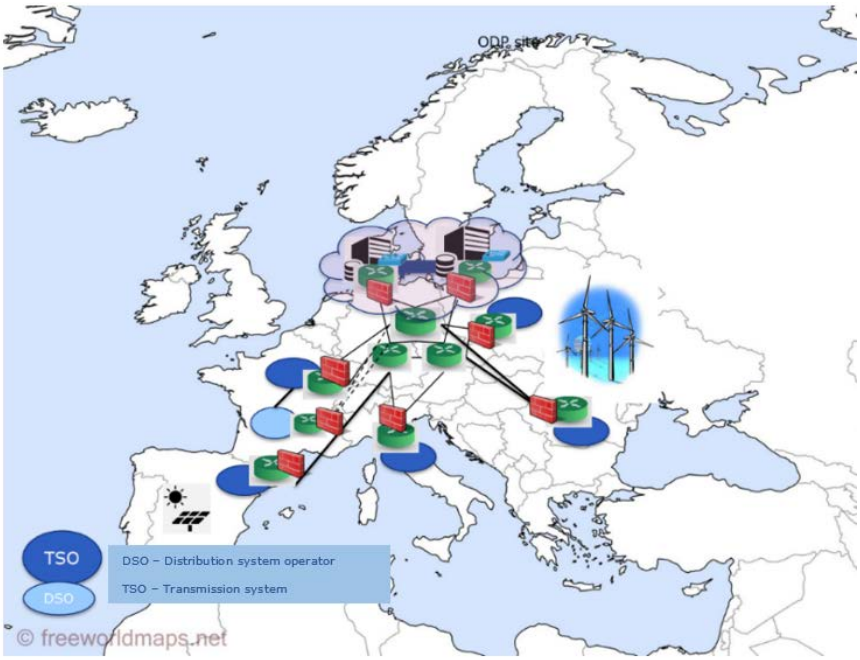
Projects could involve:

- an EU renewable energy availability platform, which will optimise the use of:
    - renewable energy generation capacity throughout the EU; and
    - interconnection capacity across EU borders;
- an EU platform connecting (via high-capacity low-latency cross-border connectivity) data centres and smart grids helping them reduce their environmental footprint and facilitate the exchange and collection of information; and
- a CAM cybersecurity platform for securing and monitoring the system and the exchange of cybersecurity information.

An EU-level approach is needed to ensure the interoperability and standardisation of the appropriate ICT solutions. Public funds are justified in order to trigger a public/private partnership and virtuous circle of investment.

The basic infrastructure investments in energy and transport require an additional digital component for maximum energy-efficiency and clean transport impacts. The platforms will be integrated in the design of future infrastructure investments. However, for legacy infrastructure they will have to be added through separate calls.

CEF2 Digital will prioritise projects that cumulatively (i) contribute to concrete EU objectives and have a significant impact on EU economy and society and on EU competitiveness, and (ii) have a cross-border character, with benefits extending beyond the financing Member States, the beneficiaries or telecoms sector.



Summary of stakeholder views:

The vast majority of respondents to the public consultation (e.g. local and national authorities, energy, telecom and transport stakeholders) expressed support for the CEF objective of deploying operational digital platforms.

Respondents emphasised the importance of cross-border implementation, in order to tackle interoperability issues arising from country-level operators' use of different languages and technologies. Some stakeholders suggested that a possible business model could be a standardised platform and/or a range of projects dedicated to use-case implementation in all cross-border areas. Respondents underlined that, in order to support the implementation of the platforms, the underlying infrastructure projects should be allowed to deploy relevant systems (over and above the 'basic' functionality of the transport/energy project), with co-financing available for the additional equipment and effort. Concrete proposals involved smart-meter energy data (Elering) and cross-border traffic control centres (Ferrovie SPA).

Respondents were generally cautious about project size, but they highlighted that consortia can vary, depending on a project's scope, from companies providing security and privacy solutions to the utility and transport companies that will benefit from the platforms, including IT integration and development companies and electronic communications operators that ensure network supply. Some respondents suggested that the Commission should clarify how synergy projects will be designed.

Potential call conditions for this funding action:

Potential beneficiaries/eligible entities	The beneficiaries will probably be consortia, including local authorities, national authorities, equipment providers, system integrators, mobile network operators, platform operators, energy companies, national transport authorities, road/rail/inland waterway (or simply transport) operators, companies providing security and privacy solutions, service

	providers and data centre operators.
Pre-conditions for participation	This action will be dedicated to 'retro-fitting' existing energy and/or transport infrastructures with the requisite cross-border digital infrastructure. Proposals should demonstrate: - the necessary cross-border interconnection of energy (electricity) and/or transport infrastructure; - the availability of the requisite energy and/or mobility data, or the capacity to guarantee it in due time; and - (for data centre projects) the existence of data centres or a commitment to build new ones in the near future.
Project selection criteria (Articles 8 and 13 of draft CEF2 Regulation)	Priority will be given to projects based on state-of-the-art technologies, taking into account aspects such as interoperability, cybersecurity, data privacy and re-use and providing guarantee open and non-discriminatory wholesale access to the assisted network infrastructure (if any).
Maximum project size(s), co-financing rate(s) and eligible cost items	EU financial assistance cannot exceed the maximum co-financing rates under Article 14(4) of the draft CEF2 Regulation. Average grant size: €30-50 million. Eligible costs: - platforms and underlying communication infrastructure, including: o hardware (servers, data storage subsystems and networking devices such as switches, routers and firewalls); and o software (e.g. databases, analytics, simulation tools); and - (if the platforms are centralised in data centres) the power and cooling systems.
Indicative timetable of CEF2 Digital calls (types and dates)	2021: studies for project preparation 2024-2025: calls for proposals

Potential complementary EU support:

The DEP (combined with the ERDF) can support the deployment of decentralised solutions and infrastructures required for large-scale digital applications in support of energy and environmental policies. This could include smart communities with open cross-sectoral urban green digital platforms for fully interoperable, scalable and decentralised smart city and smart rural area ecosystems capable of supporting cross-sector digital services. The platforms will use the information provided by the operational digital platforms to provide citizens with energy (and cross-sector) services.

For smart mobility, the DEP can support the projects serving the deployment of connected automated driving, drones, smart mobility concepts, which could complement the delivery of an open 'mobility as a service' (MaaS) ecosystem. The aim is to allow for interoperable, transparent, secure, privacy-aware and cross-border solutions to the demand side deployed on a large scale to a large number of cities, including last-mile delivery (e.g. via drones) and allowing for alternative business models. Therefore, CEF and the DEP can ensure supply-/demand-side complementarity, with the operational digital platforms managing the supply-side infrastructure and the DEP providing synergies in services based on the demand side.

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Notes

1 Proposal for a Regulation of the European Parliament and of the Council establishing the Connecting Europe Facility and repealing Regulations (EU) No 1316/2013 and (EU) No 283/2014 (COM/2018/438 final); https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52018PC0438

2 https://www.consilium.europa.eu/media/38507/st07207-re01-en19.pdf

3 https://europa.eu/rapid/press-release_IP-19-1600_en.htm

4 A Union that strives for more – political guidelines for the next European Commission; https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf

5 The Communication on "Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society"16 (the Gigabit Society Strategy) sets out strategic objectives for 2025, in view of optimising investment in digital connectivity infrastructure. See COM(2016)587 and Staff Working Document - SWD(2016)300.

6 For a summary and all the responses, please see: https://ec.europa.eu/digital-single-market/news-redirect/662829

7 National, regional and local investments can be partly funded by EU programmes (e.g. European structural and investment funds), but their implementation is managed at regional or national level (indirect management).

8 https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=17182

9 Communication – Connectivity for a Competitive Digital Single Market – Towards a European Gigabit Society https://ec.europa.eu/digital-single-market/en/news/communication-connectivity-competitive-digital-single-market-towards-european-gigabit-society

10 Article 9(1) of Provisional Agreement on CEF2 Regulation: 'Only actions contributing to the achievement of the objectives referred to in Article 3, taking into account long-term decarbonisation commitments, are eligible for funding [..].'

11 https://ec.europa.eu/digital-single-market/en/cyber-security

12 24 months should ensure that (in particular privately led) projects can apply to CEF2 Digital calls by relying on existing mapping information from their Member State, which for the purpose of state aid notifications needs to cover 36 months.

13 https://ec.europa.eu/digital-single-market/en/cross-border-corridors-connected-and-automated-mobility-cam

14 See note i.

15 COM(2015)192. One of the pillars of the Digital Single Market strategy is “maximising the growth potential of the European digital economy”, which requires “investments in ICT infrastructures and cloud computing […]”.

COM (2016)180, “Progress in digital technologies in combination with other key enabling technologies is changing the way we design, produce, commercialise and generate value from products and related services. Advances in technologies such as the Internet of Things (IoT), 5G, cloud computing, data analytics and robotics are transforming products, processes and business models in all sectors ultimately creating new industrial patterns as global value chains shift. The challenge ahead is for the European industry to seize fully and swiftly these digital opportunities. This is essential to ensure Europe's mid and long term competitiveness with implications for overall welfare”p.2.

COM (2017) 495, Free flow of data principle within the Union: “Location of data for storage or other processing within the Union shall not be restricted to the territory of a specific Member State, and storage or other processing in any other Member State shall not be prohibited or restricted, unless it is justified on grounds of public security”, the Free Flow of non-personal data Regulation, art 4.1

16 See for example: https://ec.europa.eu/digital-single-market/en/blog/digitising-energy-sector-opportunity-europe

17 Article 6(3) of CEF2 Regulation: ‘The Commission may delegate power to implement part of the Programme to executive agencies in accordance with Article [69] of the Financial Regulation with a view to the optimum management and efficiency requirements of the Programme in the transport, energy and digital sectors’. The current CEF programme is implemented in close cooperation with the Innovation and Networks Executive Agency (INEA).

18 Article 6(1) of CEF2 Regulation: ‘The Programme shall be implemented in direct management in accordance with the Financial Regulation or in indirect management with bodies referred to in Article [62(1)(c)] of the Financial Regulation’.

19 Article 62(1)(c) of Financial Regulation (Regulation (EU, Euratom) 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union, amending Regulations (EU) No 1296/2013, (EU) No 1301/2013, (EU) No 1303/2013, (EU) No 1304/2013, (EU) No 1309/2013, (EU) No 1316/2013, (EU) No 223/2014, (EU) No 283/2014, and Decision No 541/2014/EU and repealing Regulation (EU, Euratom) No 966/2012 (OJ L 193, 30.7.2018, p. 1).

20 Article 4(9) and 4(10. New)/(9a) are still under inter-institutional negotiations in the Provisional Agreement of the CEF2 Regulation could provide for voluntary transfers from shared management to CEF2.

21 Article 19(1a) of Provisional Agreement on CEF2 Regulation: '1a. In order to provide transparency and predictability and to enhance the quality of the projects, the Commission shall adopt by 31 December 2020 the first multiannual work programmes that will include the timetable of the calls for proposals for the first three years of the programme, their topics and indicative budget as well as a prospective framework covering the entire programming period.'

22 Article 13(1) of Provisional Agreement on CEF2 Regulation: 'Transparent award criteria shall be defined in the work programmes referred to in Article 19 and in the calls for proposals [..]'.

23 Article 172(2) TFEU: '[G]uidelines and projects of common interest which relate to the territory of a Member State shall require the approval of the Member State concerned'.

24 Article 14(4) of Provisional Agreement on CEF2 Regulation.

25 CEF2 – SMART 2017/0018, the final report will be published soon. See here for the interim results and the public workshop https://ec.europa.eu/digital-single-market/news-redirect/657698.

26 For a summary and all the responses, please see: https://ec.europa.eu/digital-single-market/news-redirect/662829

27 https://www.consilium.europa.eu/media/38507/st07207-re01-en19.pdf

28 5G for Europe: an action plan and the 3rd mobility package Communication On the road to automated mobility: an EU strategy for mobility of the future (COM(2018) 283).

29 Point 3 of Part V of the Annex to the CEF2 Regulation provides an indicative list of trans-European 5G corridors.

30 See: https://5g-ppp.eu/wp-content/uploads/2019/10/20191031-Initial-Proposal-5G-SDA-for-CAM-in-Europe.pdf

31 Article 2(r) of draft CEF Regulation: '"works" means the purchase, supply and deployment of components, systems and services including software, the carrying-out of development and construction and installation activities relating to a project, the acceptance of installations and the launching of a project'.

32 Nomenclature of territorial units for statistics, see: https://ec.europa.eu/eurostat/web/nuts/background.

33 The final report will be published soon. The workshop on the interim results can be watched here: https://ec.europa.eu/digital-single-market/news-redirect/657698

34 Recital 24: "(…) The Programme should contribute to providing all European households, rural or urban, with very high capacity fixed or wireless connectivity, focusing on those deployments for which a degree of market failure is observed and which can be addressed using low intensity grants. In view of maximising synergies of the actions supported by the Programme, due regard should be given to the level of concentration of socio-economic drivers in a given area and the

level of funding needed to generate coverage. Moreover, the Programme should aim at achieving a comprehensive coverage of households and territories, as gaps in an already covered area are uneconomic to address at a later stage."

35 Please note: CEF2 Digital cannot support projects that target stand-alone coverage for socio-economic drivers (SEDs) if economically disproportionate or physically impracticable.

36 Article 2(o) of draft CEF Regulation: '"socio-economic drivers" means entities which by their mission, nature or location can directly or indirectly generate important socio-economic benefits to citizens, business and local communities located in their surrounding territory or in their area of influence.

37 https://ec.europa.eu/digital-single-market/en/wifi4eu-free-wi-fi-europeans/

38 https://ec.europa.eu/digital-single-market/en/news/eurohpc-joint-undertaking-european-success-story

39 Further infrastructure investments are envisaged in the next MFF (€2.7 billion proposed by the Commission in the DEP, plus matching funds from Member States).

40 https://ec.europa.eu/digital-single-market/en/policies/building-european-data-economy

41 https://www.geant.org/

42 CEF2 – SMART 2017/0018 the final report will be published soon. See here for the interim results and the public workshop https://ec.europa.eu/digital-single-market/news-redirect/657698.

43 e.g. US Cloud Act and Chinese Intelligence Law.

44 In 2019, according to DESI.

45 https://www.bmwi.de/Redaktion/EN/Publikationen/Digitale-Welt/project-gaia-x.pdf?__blob=publicationFile&v=2

46 Today, the cloud industry is estimated to contribute up to 45% of the CO2 emissions of the entire ICT industry.

47 e.g. public administrations and hospitals.

48 e.g. operators in transport, energy, postal sectors.