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D 11.1
Summary on draft DAC deployment funding/financing mechanisms

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1. Executive Summary

This paper **describes the requirements for the funding and financing mechanisms** to be developed for DAC deployment and to indicates **options** to fulfil them. The focus is on instruments necessary for a timely, coordinated and cost-efficient deployment of DAC across EU Member States and interested third countries. It explains why a **European support for the deployment of DAC** is needed and why a **European entity** for the coordination of the Deployment of DAC could be necessary. It then describes its potential **legal basis** and **missions**.

The concept papier summarises **key findings and recommendations of the existing analysis and studies on DAC deployment** and the **expertise developed in the working groups of EDDP**. It starts from the observation that DAC deployment will not happen by itself based on sector initiatives.

It recommends the to set up a **European deployment management entity** starting from 2024 to centrally steer the set-up of the pre-deployment trains. It appears that the entity should use a **simple legal basis in a first step** (e.g. non-profit association under Belgian law or Deployment Group of the existing ERJU) **in order to be set up rapidly** and that this legal basis could be modified in the course of the programme. It can then extend its range of missions with the overall roll-out phase of DAC and might even be useful for the deployment of technology projects in the European rail sector in general.

The document **does not provide a specially designed funding programme for DAC pre-deployment** or even DAC deployment as the identification of funding programmes and the provision of funds is subject to political support and approval. **Neither does it establish the legal basis for the deployment management entity**. However, it clearly demonstrates why such an entity is needed and how it could be set up.

It appears that funding for DAC deployment must come from **different national and European sources**. In addition, a sector wide “digitalisation and automation fund” could be set up as a financing instrument that could receive payments from different sources. In the short term, there is the need to set up a solution for the **pre-deployment phase** and the **deployment management entity**. The solution found could serve as a role model for the management of the European roll-out phase.

2. Abbreviations and acronyms

Abbreviation / Acronym	Description
DAC	Digital Automatic Coupling
CEF	Connecting Europe Facility
EDDP	European DAC Delivery Programme
UIP	International Union of Wagon Keepers
VTG	VTG GmbH – Wagon Keeper based in Germany
CBA	Cost Benefit Analysis
CAPEX	Capital Expenditure
OPEX	Operational Expenditure
FIN4DAC	Project on funding and financing solutions for DAC commissioned by DB / VTG and UIP
ETS	Emission Trading System of the European Union
EIB	European Investment Bank
NPB	National Promotional Banks
MS	Member States
WK	Wagon Keepers
RU	Railway Undertakings
SESAR	Single European Sky ATM Research Programme
DDM	DAC Deployment Manager
DG	Deployment Group
TRAN	EU Parliament Committee on Transport and Tourism

3. Background

The project DACcord provides management competencies and other input to support the EU-Rail JU for the continuation of the professional management of the activities of the European DAC Delivery Programme (EDDP), enabled by the EU-Rail JU and established in the EU-Rail JU work programme, in which European Rail Freight Sector and manufacturers are united to strive for the Europe-wide introduction of a Digital Automatic Coupler.

The present document constitutes the **Deliverable D11.1 "Summary on draft DAC deployment funding/financing mechanisms"** of the DACcord project's WP 11 "**DAC deployment funding/financing mechanisms"** in the framework of the Flagship Area 5 as described in the EU-RAIL MAWP. It is drafted within the framework of the **European DAC Delivery Programme** (EDDP).

It constitutes the result of the DACcord Work Package 11 and to the EDDP Working Package 5 that handled the EU DAC Investment Plan and elaborates the Cost Benefit Analysis on DAC. It is to be seen in the broader context of the preparation for DAC deployment.

DACcord Beneficiary **railiable** was in charge of this work package, supported by the subcontractor with working expertise in EDDP WP 5 and EY's European Investment Plan study DB Cargo. The work was closely aligned with the EU-Rail JU.

4. Objective/Aim

As the Communication of the European Commission accompanying the Greening Freight Transport package published on 11/07/2023 indicates: "*It is now time* […] *to find new funding resources to make DAC a European reality*. […] *National promotional banks, commercial banks and possibly institutional investors (e.g. pension funds, insurers) could be mobilised to support investment needs, while the European Investment Bank has made investing in rail one of its priorities, including the deployment of new technologies*."

The **objective** of this work package / concept paper is to identify **requirements for the funding and financing mechanisms** to be developed for DAC deployment and potential **options** for a DAC Deployment Manager to fulfil them.

The focus of the requirements is to draft instruments necessary for a timely, coordinated and cost-efficient deployment of DAC across EU Member States and interested third countries. Based on the EU Investment Plan, WP 11 has to provide different options for the legal basis, governance and structure of the DAC Deployment Manager, contributing to the overall deployment programme. It should further reflect on the possible implementation of scenarios for funding and financing DAC deployment, as pointed out in the EU Investment Plan study.

The way mechanisms for funding and financing are designed will play a crucial role for the success of the entire European DAC project. The instruments can be designed to ensure a **timely**, **coordinated** and **cost-efficient** deployment of DAC. They should be designed to be **applicable** both across **EU Member States** and to interested **third countries.**

The starting point for this position paper is the **EU DAC Investment Plan commissioned by** Europe's Rail in 2022, the **EDDP Cost Benefit Analysis on DAC** and the preparatory analysis "**FIN4DAC**" commissioned by UIP/VTG and DB Cargo on **Funding Options, Asset-Light Financing and Governance Principles for DAC Deployment**.

5. Deliverable DAC Funding and Financing Mechanisms

5.1. Funding and Financing DAC deployment

5.1.1. Why are funding and financing needed for DAC deployment?

A major underlying assumption is that **DAC will not be deployed spontaneously by the market actors** and that the **adequate framework conditions for a timely, coordinated, and cost-efficient deployment of DAC have to be created by policy makers at national and European level**. The EU Investment Plan underlined the challenges that faces DAC deployment, cf. Chapter 3.1 Market barriers to DAC deployment:

i) **Compatibility and Interoperability** of the European wagon fleet, i.e. the possibility to exchange wagons flexibly between different operators and countries all over the European continent has to be maintained. Wagons with DAC and wagons with screw couplers are not compatible. Therefore, the migration of the non-separable fleet has to take place over a short migration period (big bang) to limit the impact of the migration on railway undertakings. A timely and coordinated migration requires central planning and steering.

ii) The **high cost and risks encountered by first movers** in DAC deployment that will not lead to a spontaneous introduction of the innovative solution, except for isolated cases in separable traffics.

iii) The **uneven distribution of cost and benefits** among market actors within the railway sector.

iv) The **negative business case** for the industry in the short term. In the short term, industry has to face considerable investments in the upgrade of waggons and locomotives. The benefits will only materialise in the mid- and long-term as the European waggon fleet is migrated to DAC and automation components are operational.

v) The **limited financing capacity of the industry**. The EU Investment Plan indicates that the margins of the in the industry are low or negative and that the industry therefore has no capacity to auto-finance the necessary long-term investments.

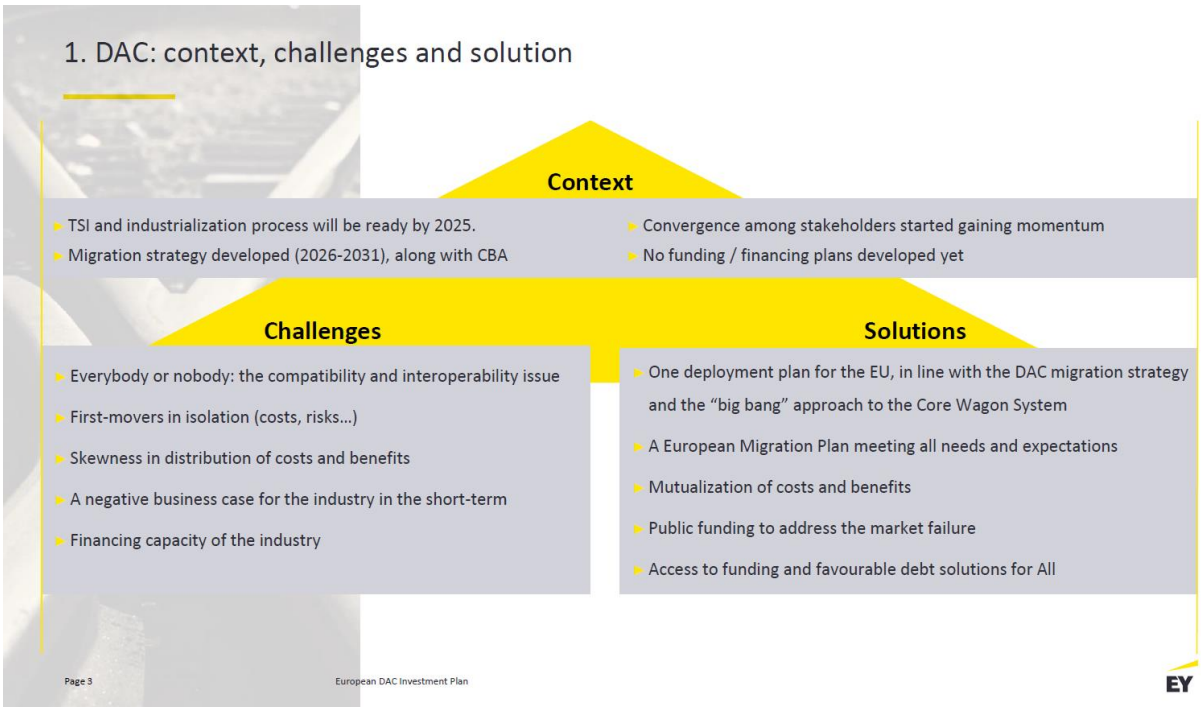
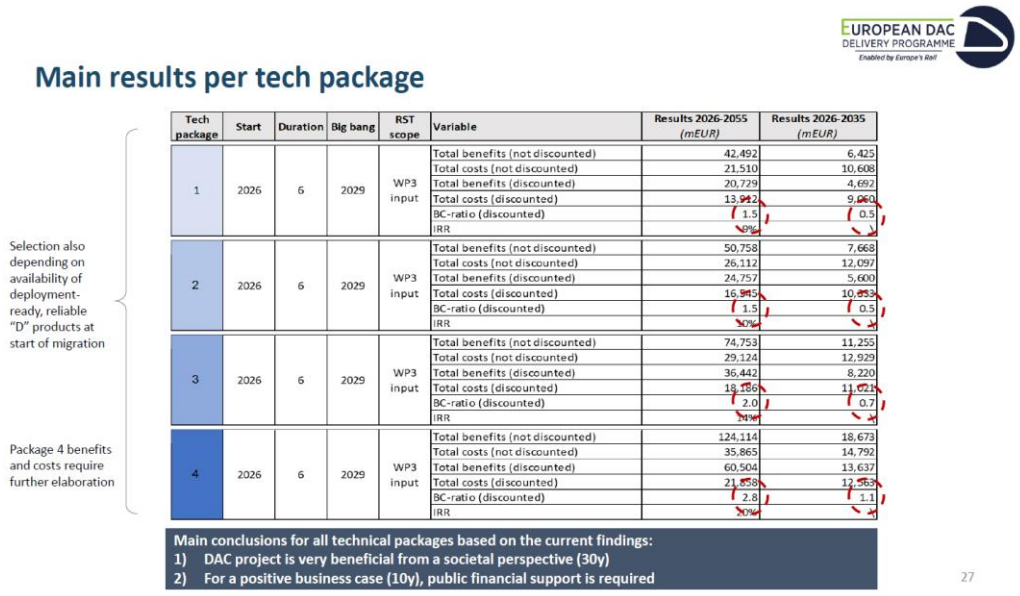


Illustration: European DAC Investment Plan, Presentation of Conclusions, Context / Challenges / Solutions, DAC Programme Board Meeting, 14/02/2023.

The **DAC Sector Statement** published on 10/07/2023 pointed out that "*the market alone cannot bear such a transformation, and no single company will be able to gather alone the necessary capital investments for such an endeavour, because it is first and foremost a European scale type of investment*". The statement therefore calls for "substantial public support" and recommends setting up a "single, non-discriminatory, European funding and financing scheme". It points out that "*the funding rate must avoid any deterioration of the competitiveness of the European rail freight sector in general and its individual members*." Furthermore, it should "*reflect the time lag between investments and the full realisation of benefits*." The legal and budgetary framework for DAC Deployment should be fully set up by 2028, preparing in particular from 2025 the large-scale testing phase across Europe for DAC based technology with up to 100 pre-deployment trains that will enter into service from end of 2026.

While the industry cannot ensure the necessary investments, the Cost-Benefit-Analysis on DAC shows that there is a **positive case for DAC over a period of 30 years** with a benefit cost ratio between 1.5 and 2.0 **from a societal perspective** taking into account **modal shift to rail** and the **reduction of emissions**. DAC as the enabler for the digitalisation in rail freight will enhance modal shift to rail and make a strong contribution to the reduction of greenhouse gas emissions. However, **there is no short-term business case for DAC from an industry perspective**. Even over the long period of 10 years by industry standards, there is no positive business case for industry.

As the European Commission pointed out in its Communication accompanying the presentation of the Greening Freight Transport Package, "*The ambition of shifting to more sustainable and energy-efficient forms of transport such as rail and inland waterways by boosting their attractiveness is key to ensuring a more future-proof freight transport*.". Rail freight traffic is expected to increase by 50% by 2030 and to double by 2050.



EUROPEAN DAC DELIVERY PROGRAMME
Enabled by Europe's Rail

Main results per tech package

Tech package	Start	Duration	Big bang	RST scope	Variable	Results 2026-2055 (mEUR)	Results 2026-2035 (mEUR)
1	2026	6	2029	WP3 input	Total benefits (not discounted)	42,492	6,425
					Total costs (not discounted)	21,510	10,608
					Total benefits (discounted)	20,729	4,692
					Total costs (discounted)	13,912	9,060
					BC-ratio (discounted)	1.5	0.5
					IRR	8%	
2	2026	6	2029	WP3 input	Total benefits (not discounted)	50,758	7,668
					Total costs (not discounted)	26,112	12,097
					Total benefits (discounted)	24,757	5,600
					Total costs (discounted)	16,945	10,853
					BC-ratio (discounted)	1.5	0.5
					IRR	10%	
3	2026	6	2029	WP3 input	Total benefits (not discounted)	74,753	11,255
					Total costs (not discounted)	29,124	12,929
					Total benefits (discounted)	36,442	8,220
					Total costs (discounted)	18,186	11,621
					BC-ratio (discounted)	2.0	0.7
					IRR	14%	
4	2026	6	2029	WP3 input	Total benefits (not discounted)	124,114	18,673
					Total costs (not discounted)	35,865	14,792
					Total benefits (discounted)	60,504	13,637
					Total costs (discounted)	21,858	12,363
					BC-ratio (discounted)	2.8	1.1
					IRR	20%	

Selection also depending on availability of deployment-ready, reliable "D" products at start of migration

Package 4 benefits and costs require further elaboration

Main conclusions for all technical packages based on the current findings:
1) DAC project is very beneficial from a societal perspective (30y)
2) For a positive business case (10y), public financial support is required

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Illustration: European DAC Delivery Programme, DAC CBA Consultation, 30/09/2022.

5.1.2. What has to be funded and / or financed?

The major share of the cost of DAC deployment concerns the European **wagon fleet** of currently about 450.000 wagons. In addition, the European locomotive fleet of about 17.000 vehicles has to be equipped with hybrid couplers, more complex than the standard DAC coupler that can handle both, screw couplers and new DAC couplers. The DAC upgrade concerns both, electric line locomotives and last mile shunting locomotives that are predominately diesel engines. The DAC Sector Statement published in July 2023 estimates the **total cost of DAC deployment from 2028 to 2032 to 13 bn€ based on prices of 2021**. As a first step, 200M€ are deemed necessary for the pre-deployment phase starting in 2026 with up to 100 pre-deployment trains that are to prepare a successful migration to DAC technology. Another 10M€ are required for the set-up of a European deployment entity for the DAC technology.

When speaking about DAC deployment, we do not refer only to the **coupler** itself. In fact, the major **use cases** that will have the greatest benefit for the sector are based on the use of **automation components** to be deployed on **wagons** and the role of **DAC as enabler of the digitalisation and automation of rail freight**. So, the investment concerns both the coupler and the automation components that are to be installed on the wagons and that will be interlinked by the power and data line provided through DAC. In addition, depending on the type of wagon used, the **wagon may have to be prepared** to receive the coupler and will receive a draw gear before the installation of the coupler. **Locomotives** will have to be equipped with hybrid couplers. Depending on the weight, the type and the age of the locomotive, solutions will have to be elaborated on how to equip the locomotives with hybrid couplers. Weight restrictions and the ability of the locomotive frame to be equipped with a central coupler have to be taken into consideration. The upgrade will be particularly difficult for shunting locomotives, as there are often small series and old vehicles still in operation. Finally, investment in **infrastructure** will be necessary. A major position is the expected retrofit of buffer stops in rail infrastructure.

DAC deployment, will require both **investment** (CAPEX) and **expenses** (OPEX). The following table gives an indicative overview of the different positions. While investment cost can be identified fairly easily, the estimation of the operational expenditure involved in the DAC deployment is more complex.

CAPEX	OPEX
- DAC mechanical coupler - DAC electric coupler - Draw gear - Automation components - Workshop equipment (tools, material)	- Installation of couplers (planning of the installation, preparation of locomotives and wagons, installation, authorisation of retrofitted vehicles) - Logistics cost (transport, storage and distribution of couplers) - Training of staff

	- Definition of an emergency / rescue concept - Additional resources necessary for test phase - Adaptation of IT Systems - Adaptation of Operational rules and processes to DAC

Additional operating costs during migration (downtime costs for locomotives and wagons, additional shunting, cost of staff training) are not considered in the calculation of the EU DAC Investment Plan, but should be kept in mind when designing the overall funding / financing scheme.

Finally, as DAC will pave the way for digitalisation of freight trains and provide a wide range of digital information on wagons, their technical status and their use in rail freight operations, **additional investment in IT systems** of railway undertakings, maintenance service providers and wagon keepers will be necessary to integrate this information in existing IT systems or to replace existing IT systems by up-to-date tools.

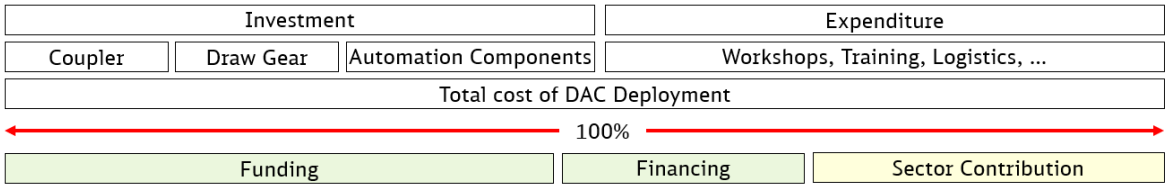


Illustration: schematic diagram prepared by the author.

In addition to CAPEX and OPEX, the FIN4DAC project pointed out that **inflation, financing cost and risk premiums** have to be taken into consideration. At the time of the basic cost estimate, the extent of the global **inflation** and the evolution of wages in the industrial sector were not foreseeable. Therefore, a corresponding cost inflation of at least 3.5% p.a. must be taken into account for the capital requirements of the rollout from 2028 onwards. This alone represents an increase in capital requirements of EUR 2 billion. With regard to **financing costs**, we are coming out of a zero-interest rate phase and have been confronted with rising financing costs for some time. Of course, this also applies to public budgets. This cost lever for the sector will be greater, the lower the level of public support. Finally, **risk management** and thus a corresponding risk reserve is necessary to ensure resilience during the critical migration phase and to avoid cascading knock-on effects. Risks may arise in the areas of technology, operation, access to funding and financing availability and a.o. the corresponding realization of the benefits of the automation components in terms of amount and timing. As the capitalization of companies in the sector is very low, a sufficient risk buffer needs to be calculated and set up for the DAC's financing needs.

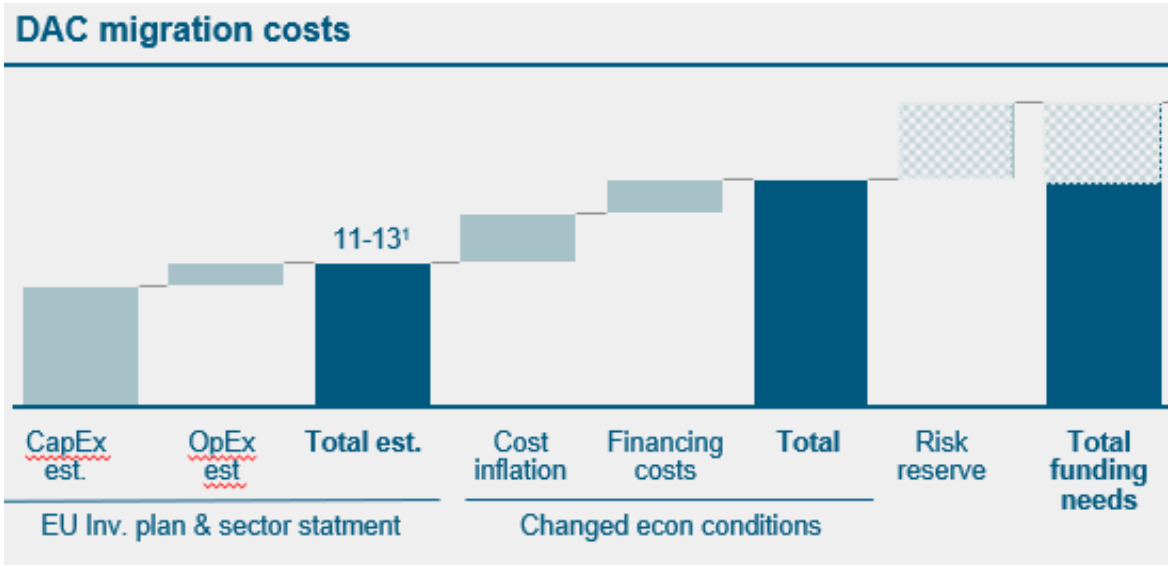


Illustration: Connected Value, DB / UIC project “FIN4DAC”, January 2024.

5.1.3. What is the differentiation between funding and financing?

Typical **funding** instruments are **grants** and **subsidies**. They could be provided by the European Union, EU Member States and third countries. They do not have to be paid back by the companies that receive them.

Financing instruments and **guarantees** could be set up by promotional banks such as EIB on the European level or their equivalents on the national level. Financing instruments could also call on private capital.

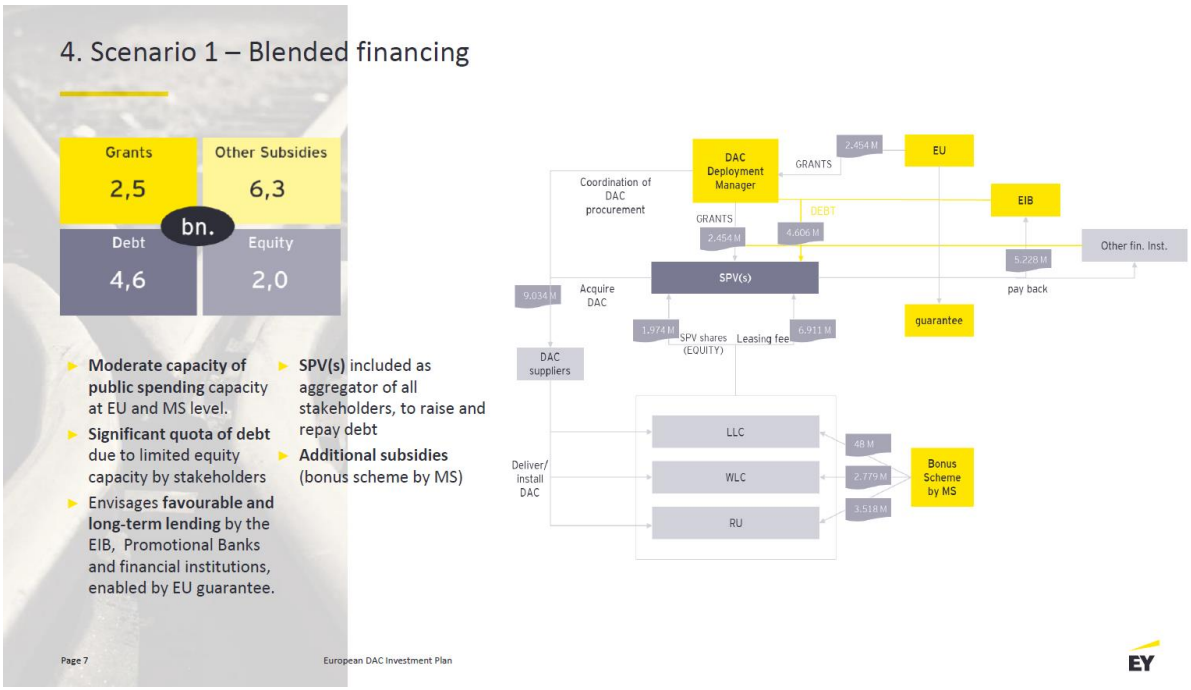
Financing instruments and guarantees have to be **viable for investors** and offer a **positive business case** over the intended investment period, including a risk premium. DAC investments would be long term investments for investors looking for long term placements. The risk premium will have to be taken into account as additional cost for railway undertakings and wagon keepers.

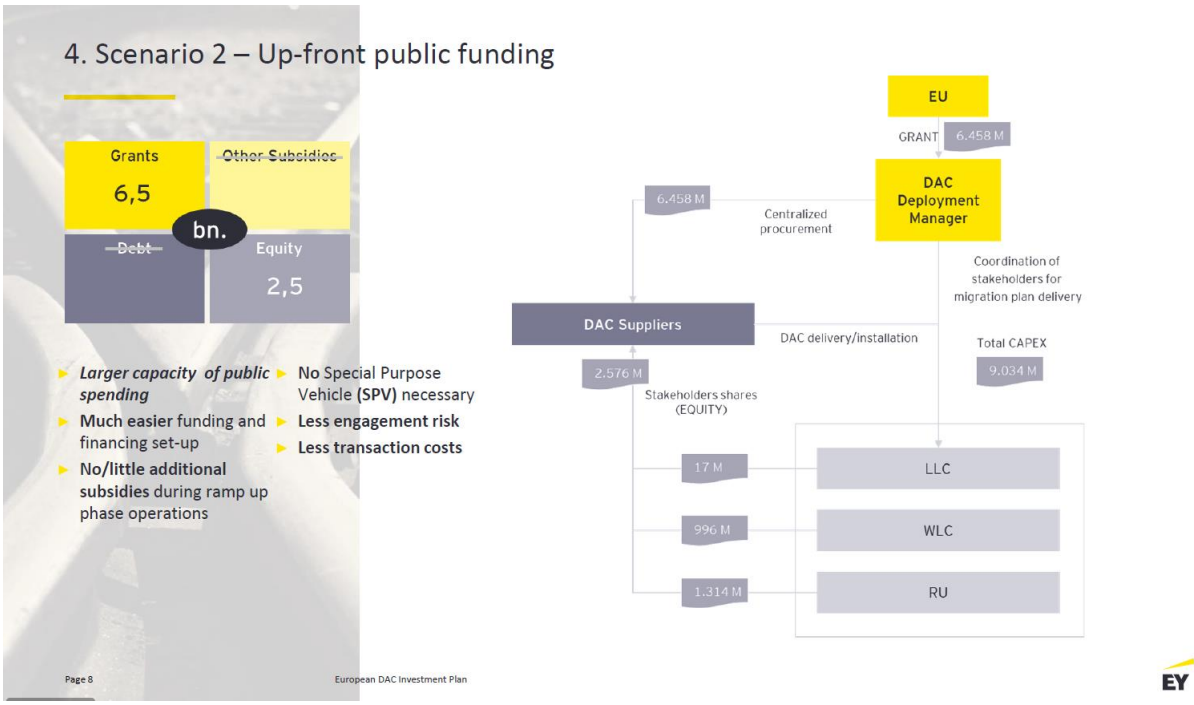
The EU Investment Plan showed that the short-term business case of DAC for railway undertakings is negative. In addition, the investment capacity of industry stakeholders is very limited. Therefore, the **sector calls for a high level of public funding for DAC deployment**, as included in the DAC sector statement.

5.1.4. What are relevant mechanisms for funding and financing DAC Deployment?

DAC is a technology that tackles several challenges currently faced by the European Union and its Member States: Greening Freight Transport, Reducing Negative Externalities of Transport, Improving Competitiveness of Rail Freight Transport, Reducing Energy Consumption (by modal shift to rail) and Digitalising Rail Freight. Therefore, funding and financing instruments for DAC deployment can be taken from a wide range of policy instruments that are implemented by the different Directorate Generals of the European Commission.

The DAC EU Investment Plan refers to two scenarios, one based on **blended financing** and another, simpler scenario based on **up-front public funding**. The main difference is that in the second scenario, there is no special purpose vehicle required which makes the funding solution easier and reduces the administrative burden. The first scenario includes the payment of a leasing fee by the industry stakeholders (locomotive leasing companies, wagon leasing companies and railway undertakings). It also includes a bonus scheme for wagons equipped with DAC that could benefit for example from lower track access charges.





Illustrations: European DAC Investment Plan, Presentation of Conclusions, Context / Challenges / Solutions, DAC Programme Board Meeting, 14/02/2023.

At the time of the finalisation of the DAC EU Investment Plan, the authors of the Plan **could not find any willing third-party investors to commit to an equity investment** (cf. p. 45 of the final report). Indeed, the risks concerning the technical maturity of the coupler, the

political support to implement the project and the business case were deemed to be too high to make the project attractive for third party investors at this stage. This underlines the necessity to help the project emerge with public support until it reaches a stage when it is mature for private investment.

Potential sources of funding that were identified by the EU Investment Plan were the "**Connecting Europe Facility**", the "**European Recovery and Resilience Fund**", the instrument "**RePowerEU**", the "**European Regional Development Fund**" and the "**Cohesion Funds**".

The DAC project could be included in the **work programme of the Connecting Europe Facility** (CEF) in order to allow for funding through this instrument. The rules governing the CEF funding should be adjusted in order to allow for investments in rolling stock to be funded through the CEF instrument. CEF funding is primarily focused on infrastructure investments. DAC, by providing additional capacity on existing rail infrastructure, makes a strong contribution to improving rail infrastructure in Europe and is therefore closely linked to the objectives of CEF (cf. ETCS deployment for which CEF funds are also used).

The Connecting Europe Facility 2 (CEF 2) has a budget of around EUR 33 bn. for the 2021-2027 funding period. DAC was not explicitly taken into account for this funding period. Attempts are currently being made in an ongoing call for 2024 to anchor the expenditure of up to 10M€ for the so-called **pre-deployment management** as eligible for funding. Since the current call 2024 has a total volume of 640M€, it is very unlikely that the capital requirements for the pre-deployment trains of another 200 M€ can be taken into account to a large extent. If there were a CEF 3 from 2028-2034 with a similar volume as in CEF 2, it is already apparent here that the capital requirement for the introduction of the DAC would significantly overburden the volume distribution of the CEF 3. Therefore, additional sources of funding have to be identified.

Another potential source of funding for DAC could be the "**Recovery and Resilience Fund**" of a volume of 723,8 bn€. DAC deployment would have to be included in the national programmes related to the RRF.

Due to the overall volume of investment requirements, the implementation of a sector-wide "digitalization and automation fund" should be examined in addition to individual subsidies in the form of specific funding programs. This fund could be funded by **both public revenues and sector revenues**. In concrete terms, cash flows from the EU emissions trading system (EU ETS) could be used here, but also contributions from infrastructure operators and other beneficiaries of the transformation. Also, private investment could be attracted, for the DAC deployment phase from 2028. In order to ensure non-discriminatory access to this additional income for the financing of DAC by all sector companies, this fund should be jointly organized and managed by a single body connected to the deployment entity.

In conclusion, it can be distinguished between the **DAC pre-deployment phase** which will **require a full public funding** for the initial set up of the deployment management (estimated to 10M€ that could come from the CEF budget) and the first commercial pilot trains, the so called pre-deployment trains as of end of 2026 (funding need estimated to 200M€) and the **roll-out phase from 2028** by which the technology is deemed to be sufficiently mature to attract **not only public funds but also private investors**.

5.1.4.1. Alternative financing models for DAC deployment

In addition to incorporating upfront purchase grants and guarantees from the public sector, there could be a solution in examining the implementation of a **sector-wide "Digitalization and Automation Fund",** which could act as a "framework" and solid foundation for joint future investments in the rail freight sector.

The financing structure should be supported by financial investors and vehicle keepers and should be open to all vehicle keepers in the sector.

To provide sufficient security to investors and to reflect the criticality of the migration phase in terms of cash flow, **additional ongoing revenue sources** should be included in the financing. These could include:

- annual payments by Member States for capacity expansion in rail freight
- revenues from EU Emission Trading System and the allocation of carbon credits
- contributions from network operators and other beneficiaries, and potentially
- fixed rental payments by shippers or railway undertakings.

The revenues could be collected and pooled collectively by an entity, e.g., a Payment Service Provider on behalf of the deployment manager.

To mirror the technical-operational migration on the financial side, it is essential to provide and prepare a trial operation in 2024 / 2025 to be operational as a framework for the pre-deployment phase at the end of 2026. This financial and organizational pre-deployment includes the development and provisional setup of the joint financing solution in means of a 'Digitalization and Automation Fund'. These efforts are essential for being able to demonstrate a tested structure with real financial figures for the financing of the DAC rollout.

Also, the identification and negotiation of additional revenue sources is needed, including cost-benefit analysis with success Key Performance Indicators, in order to secure the revenue side for the financing solution.

Potential Sources of Funding and Financing

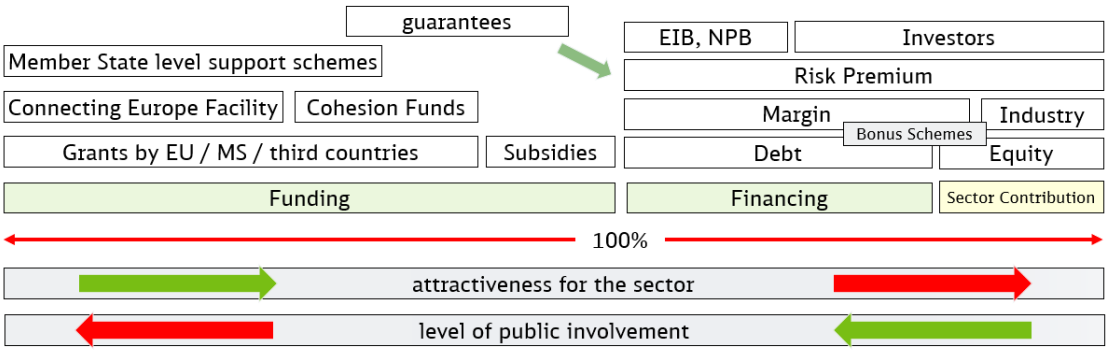


Illustration: schematic diagram prepared by the author.

5.1.4.2. Scenarios for funding and financing full DAC deployment

With regard to funding and financing models for the roll-out phase (as opposed to the pre-deployment phase), different scenarios can be imagined.

In **Scenario 1**, there is a combination of public funding from different sources within the European Union, Member States and Third Countries that add up to 90% of total expenditure. The funding could come from the Connecting Europe Facility, the European Innovation Fund, the Recovery and Resilience Fund, funding instruments related to the Green Deal objectives or – for the relevant cohesion countries – from the cohesion fund. The European Rail sector would make a contribution of approximately 10% focussing mainly on the operational expenditure of the migration. It is recommended to administer the funding through a one-stop-shop (which could be managed by a DAC deployment manager) in order to avoid complexity through parallel requests and administrative burden by different funding schemes. The model is very simple and attractive for the rail sector. However, it requires a high level of public funding.

Funding and Financing Models
Scenario 1

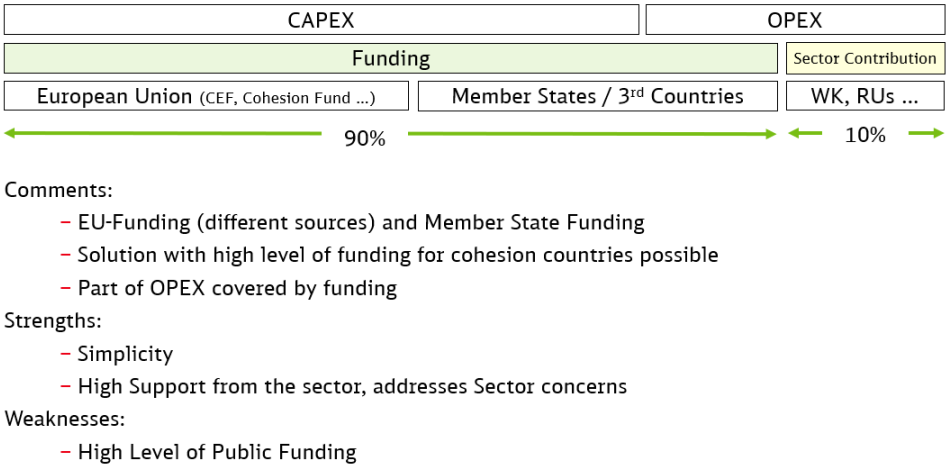
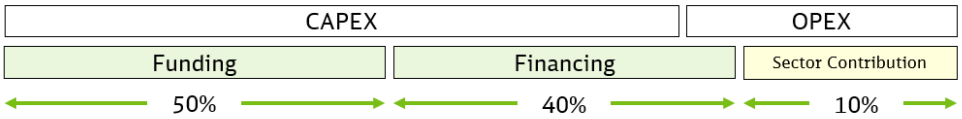


Illustration: schematic diagram prepared by the author.

In **Scenario 2,** the funding is completed by a part of financing. The levels of the respective parts are indicative. Including a financing part that has to be reimbursed and that should be attractive for investors undoubtedly adds complexity to the model. The cost of financing and a risk premium have to be included in the total cost of the project. The investment should be attractive to third party investors for this scenario to be implemented. Otherwise, the deployment of DAC will be put at risk.

Funding and Financing Models
Scenario 2



Comments:
- EU Funding and Member State funding
- Financing on top of funding instruments

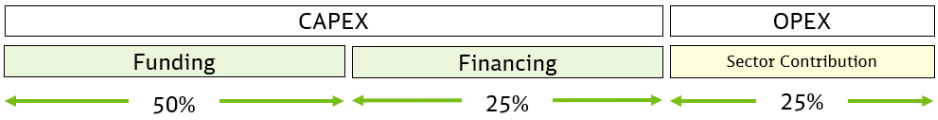
Strengths:
- Addresses sector concerns
- Balanced contributions

Weaknesses:
- Complexity, Set Up of financial model
- Cost of Financing / Risk Premium
- Readiness of Investors to invest

Illustration: schematic diagram prepared by the author.

In **Scenario 3**, the European rail sector assumes the total level of operational expenditure. This scenario requires a lower level of public support. The Financing part is reduced compared to the total cost of the project. However, the support of the rail sector is uncertain as it will have to face the full operational expenditure and the cost of financing.

Funding and Financing Models
Scenario 3



Comments:
- EU Funding and Member State funding
- Financing on top of funding instruments
- Sector covers full share of OPEX

Strengths:
- Lower Level of public Backing required

Weaknesses:
- High Level of Complexity
- Sector support uncertain / unlikely
- Readiness of Investors to participate, risk premium

Illustration: schematic diagram prepared by the author.

5.1.4.3. How can risks linked to the DAC project be identified and managed?

In order to establish the necessary trust, especially among potential investors, a joint risk management is of high priority to provide the necessary security to all participants among financial investors, public sector, wagon keepers, shippers, railway undertakings and manufacturers.

The European roll-out of DAC involves **risks on two levels**. On the **financing level**, direct monetary risks must be taken into account, such as rising financing costs due to increases of interest rates and price increases on the production cost side due to inflation. Both cost risks are already evident and must be taken into account. On the **technical / operational level**, unforeseeable insights can be gained during the pre-deployment phase and in the first roll-out phase at the product level and also at the operational level of the wagon keepers. Therefore, **appropriate risk management** is necessary to ensure resilience during the critical migration phase and to avoid cascading knock-on effects.

Risk management should be part of the central, European deployment management and, in close coordination with the national risk managers, should have an important steering function in the preparation and implementation of the migration. This is to ensure that knowledge on risks is shared and exchanged.

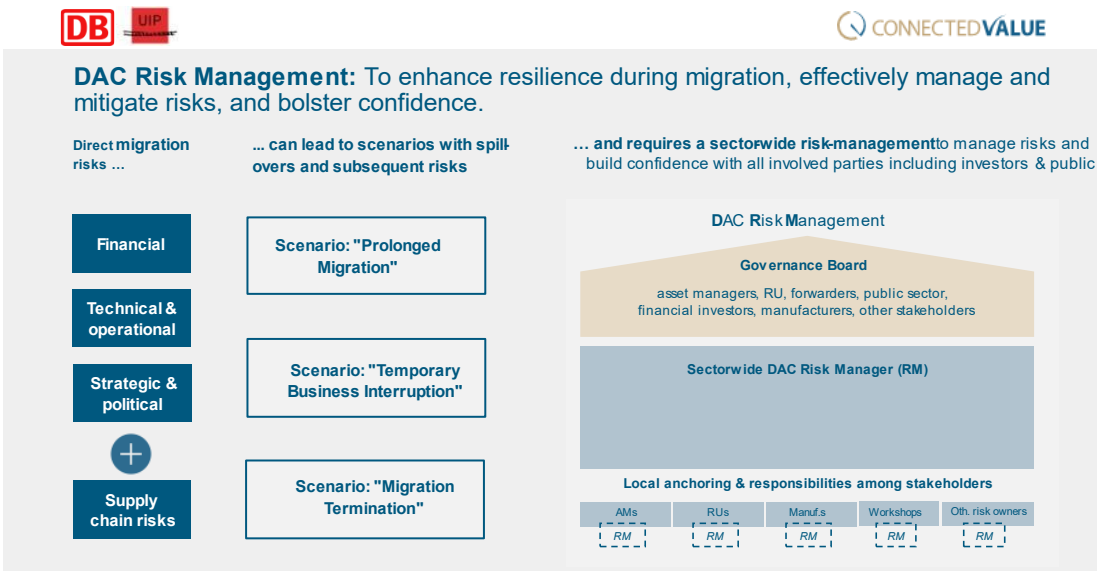


Illustration: Connected Value, DB / UIC project "FIN4DAC", January 2024.

5.1.4.4. What are potential next steps for funding and financing DAC deployment?

In order to reflect the technical-operational migration on the organizational and financial side, **three work packages** are to be further developed starting from 2024 to prepare for pilot operation of pre-deployment trains from end of 2026:

1) **Financing Structures**: the identification of funding instruments and funding programmes with appropriate development of the funding regime and also the negotiation of financing and additional sources of revenue, including the cost-impact analysis with success KPIs in order to secure the revenue side for the financing solution.

2) **Funding**: the deepening and provisional set-up of the joint financing solution ("digitalization and automation fund") for the pre-deployment in order to be able to present a proven organizational structure with real financial figures for the financing of the roll-out.

3) **Risk Management**: the establishment of a joint risk management system in order to provide all parties involved, such as financial investors, the public sector, wagon owners, shippers, railway undertakings and manufacturers, with the necessary visibility on a financial and technical-operational level.

It is recommended to set up these workstreams within work area D (ex-WP5, cf. EDDP programme architecture on page 29) of the European DAC Delivery programme (cf. overview of programme structure), as this working package is in charge of the Cost Benefit Analysis and of the economics of DAC deployment.

5.2. European Management of DAC Deployment ("DAC deployment management entity")

The deployment of Digital Automatic Coupling (DAC) in rail freight transport in Europe is a **complex political, organisational and technical project** with a **clear *European* dimension**. One of several major **challenges** is migration, the transition from the screw coupling used today to the Digital Automatic Coupling. There is much to be said for central **control of this migration**. The successful deployment of DAC requires a pan-European effort. The deployment of the coupling has an impact on the productivity and competitiveness of the rail freight transport system (see use cases and cost-benefit analysis) above all if it is not introduced in individual transports or individual countries, but on the **entire European rail freight network**: more than 50% of the traffic volumes in Europe are cross-border and therefore **require an internationally coordinated and planned approach**. Today's **flexible and therefore efficient use of vehicles** requires a managed approach in order to be able to effectively produce freight transport services during the conversion phase, even if there are limitations in compatibility (2 coupling systems at the same time in the same network) up to 70% of the European wagon fleet will sooner or later be used together directly or indirectly.

A gradual conversion of the freight wagons to the DAC with a long-term retention of the screw coupling would lead to **considerable additional operational expenses** and thus high additional costs in the production of European rail freight. Therefore, the European Programme for the Deployment of DAC (EDDP) proposes to maintain the availability of vehicles for the market during the conversion phase ("migration") **with a coordinated migration strategy** and thus also to enable the planned traffic growth until 2030 and beyond. Which migration strategy is used for which vehicle is based on the needs of the customers, seasonality, types of goods, the available infrastructures in the customers' sidings, modes of transport, workshop capacities and vehicle types.

In any case, the goal must be **to optimize the relationship between benefits and costs**. In doing so, individual national approaches should be avoided, and preference should be given to a coordinated European solution supported by all relevant companies. This requires a minimum of European coordination through a common steering unit.

5.2.1. What are the general requirements for such a steering unit?

This complex conversion in a defined period of time (currently estimated to 6 years) requires **long-term preparation** and a **central European control** system in order to prevent incompatibilities between vehicles with screw coupling on the one hand and DAC on the other. Key points critical to success are adherence to the schedule, adherence to the budget, avoidance of operational disruptions due to incompatibilities between vehicles, **the greatest possible process efficiency and harmonization, and the greatest possible**

neutrality. In addition to the couplers themselves, the availability of the additional components of the so-called "DAC basic package", such as the automatic brake test, which are also required as basic equipment, are of great importance. These components contribute to the digitalization and automation of rail freight transport and are indispensable for achieving the necessary cost-effectiveness according to cost-benefit analysis.

The deployment of DAC should be supported by partners in the relevant EU Member States or third countries, as well as by the associations and companies concerned. The aim must be to ensure that rail freight customers do not suffer any loss of quality as a result of the migration and that friction losses are kept as low as possible. Therefore, solutions should always be sought and found that are based on the following principles: non-discriminatory, subsidiary, economically optimized, and technically, legally and logistically feasible.

5.2.2. What are the tasks, a European Unit could assume to ensure the Deployment of DAC?

In December 2022, the European DAC Investment Plan for the deployment of DAC, commissioned by Europe's Rail Joint Undertaking, envisaged the following architecture for a possible governance of a European deployment management: a supervision on the policy level by the European Commission, a European DAC Deployment management entity on the management level and an implementation level with the stakeholders from the rail sector across Europe:

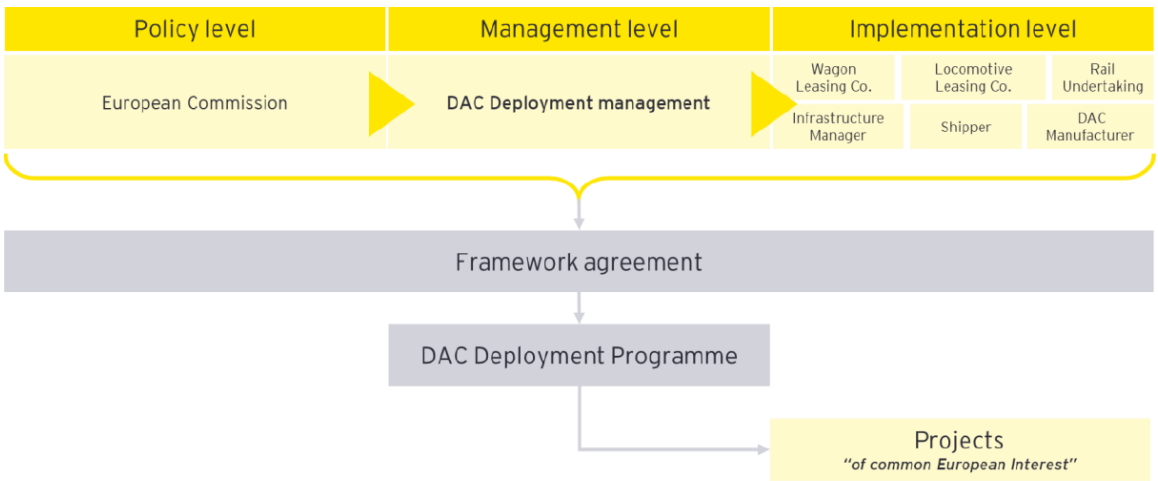


Figure 6.1 – DAC Deployment Management Framework

Illustration: European DAC Investment Plan, Final Report, 16/12/2022, page 56.

The Joint Undertaking SESAR (Single European Sky ATM Research), in which 26 Member States, 8 third countries, as well as important associations, research institutions and companies are working on the introduction of technology projects for the modernisation of European air transport, could be seen as a role model für the DAC Deployment Management.

In order to roll out the technology projects, a structure has already been put in place for the roll-out of technology projects in Europe and associated third countries. In addition to the Joint Undertaking SESAR, the SESAR Deployment Manager takes the form of a consortium led by Eurocontrol and comprising some of the stakeholders represented in SESAR. Manufacturers are not represented in this consortium so that there are no conflicts of interest. The staff of the Deployment Manager (approx. 80 people, many of them proportionate) are provided by the stakeholders involved (e.g. Lufthansa, Air France, in particular national air traffic controls, etc.) and are financed by a grant agreement between the EU and the consortium. The consortium is limited in time. The total investment budget is of 2.7 bn € of grants and industry investments. SESAR acts as a bundler and advisor for the formation of sector consortia to apply for projects with CEF funding ("mobilisers"). The purpose is to implement technology harmonisation in the Member States in a bundled, uniform/harmonised manner as far as possible and to increase the administrative efficiency of the projects. As of today, SESAR has implemented 271 projects. The degree of implementation varies from country to country.

The proposal to set up a European entity for the deployment of DAC is already included in the European Investment Plan for DAC and is outlined with the **timetable** below :

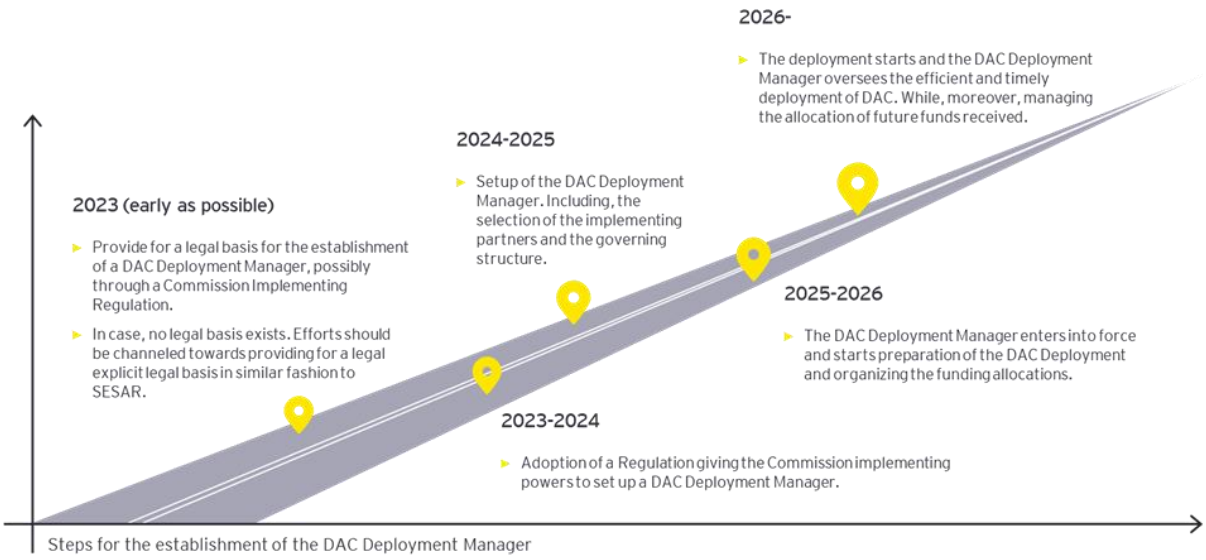


Illustration: European DAC Investment Plan, Final Report, 16/12/2022, page 80.
In particular, it should be noted that the timetable is ambitious, particularly when it comes to creating the necessary legal basis and providing the necessary resources (cf. below).

More specifically with regard to the potential missions, a European deployment management entity to be set up for a defined migration period, building on the current architecture of the programme, could carry out the following tasks:

1. **Overarching institutional framework** (bloc B, 1+2)
   - Set up of a legal framework for the participating institutions, companies and associations to coordinate, discuss and decide
   - Interface to the relevant European institutions (e.g. EU Commission, ERA, CINEA, EIB)
   - Coordination with national partners in the relevant European Member States or third countries
   - Interface to the relevant associations in European rail freight transport
   - Management of exceptions for particular gauges or countries

2. **Funding and Financing** (bloc D, 1-4)

   - Central, non-discriminatory one-stop shop for public funding and guarantees, including resources from the Cohesion Fund and third-party funding (e.g. Switzerland, Norway)
   - Acquisition of subsidies for DAC and the additional automation components as well as associated funding requirements (e.g. infrastructure adjustments)
   - Setting up financial instruments with public development banks (EIB, KfW) or private investment funds
   - Management of Established Financial Instruments ("DAC Funds")
   - Synchronisation of support for DAC migration in the EU and in third countries such as Switzerland or Norway
   - Setting up financing guidelines
   - Control of a possible DAC Revenue Models to be set up

3. **Procurement and Management of Parts** (bloc D, 3)

   - Central purchasing of couplings and additional components in order to realize economies of scale
   - Management of the tender and the award in compliance with relevant European requirements and thus reduction of costs for the overall project before and during the migration
   - Application of a non-discriminatory unit price for all companies in the sector using the DAC, with subsidies offset against the purchase price
   - Establishment of a non-discriminatory and streamlined system for the retrieval and clearing of subsidies for the buyer in order to relieve the tight timing of migration from the time required by bureaucratic processes
   - Linking the roll-out to the migration plan and the funding/financing planning to ensure the success of the migration, to keep the availability of the vehicles high, to

further enable the planned growth and to prevent the unwanted encounter of vehicles with DAC and screw coupling
- If necessary, setting up a central material pool
- If necessary, setting up a central logistics system for the distribution of couplings
- Centralization and support of the owners in case of possible warranty claims against the manufacturers
- Monitor and, if necessary, control the software compatibility of digital components during the migration period (devices assembled in year 1 of the migration must work together with those from year 6)

4. **Migration planning and steering** (bloc C, 1-5)

- Pre-migration planning, fleet analysis
- Preparation and operation of central, neutral databases to handle the migration
- Preparation of the vehicles for the migration strategy agreed with the owner, e.g. for the status "DACready" in a first step
- Conversion planning, commissioning planning
- Planning of necessary adjustments to IT systems and infrastructure
- Avoidance of additional production costs for railway undertakings due to incompatibility between different coupling types
- Prevention of operational disruptions caused by conflicts between vehicles with different clutch systems
- Coordination between railway undertakings, wagon keepers and workshop operators, capacity planning
- Creation of an exchange for the communication of free capacities in the workshops, through which vehicle owners can book pre-conversions and conversions
- Establishment of an out-of-court dispute resolution mechanism between participating companies, associations, EU Member States and third countries

5. **Technology / Approval / Operational Processes** (blocs A, 1, E and F)

- Provision of technical documentation via a central database
- Establishment of an exchange of experience
- Distribution of conversion recommendations for different vehicle types
- Setting up a contact point for questions about vehicle approval
- Clarification of the approval of vehicles converted to the DAC with the least possible effort for the owners, co-development of the corresponding approval process
- Participation in the revision of the relevant TSIs
- Adaptation of the operating processes to the target processes with the DAC

6. **Status monitoring, risk management, reporting, compliance** (overarching)

- Set up Key Performance Indicators to monitor the progress of the migration

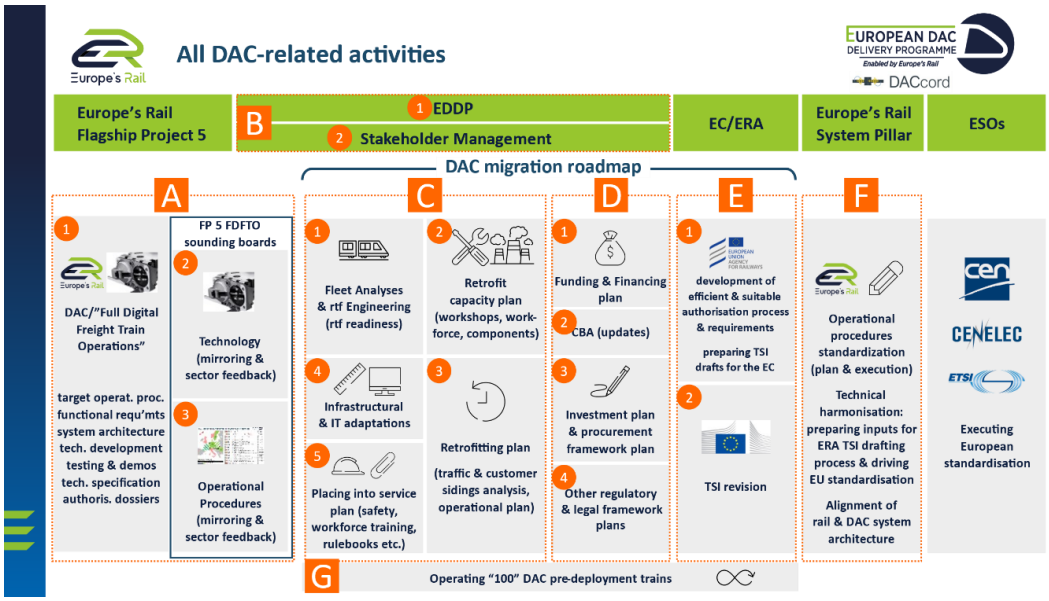
- Identification of conflicts and problems
- Development of proposals for countermeasures
- Adaptation of migration planning as needed
- Identification and monitoring of risks, risk management
- Setting up risk management guidelines, methodology and tools
- Inclusion of public guarantees and risk transfer to other stakeholders (e.g. manufacturers) where appropriate and expedient
- Monitoring compliance with legal requirements
- Documentation of the correct use of funds in terms of economy, efficiency and expediency

7. **Communication** (overarching)

- Deployment Manager Activity Report
- Migration Progress Report
- External communication for the deployment of DAC
- Exchange of best practices

8. **For discussion: preparation and coordination of the Pre-Deployment Trains** (bloc G)

- Central information about test trains (number, country, RU, wagon type, operating conditions, etc.) and maintenance of a network of contact persons in the participating companies
- Procurement of funding for the implementation of the projects
- Communication about project status and project successes
- Development of the above-mentioned functions for the implementation of test train projects

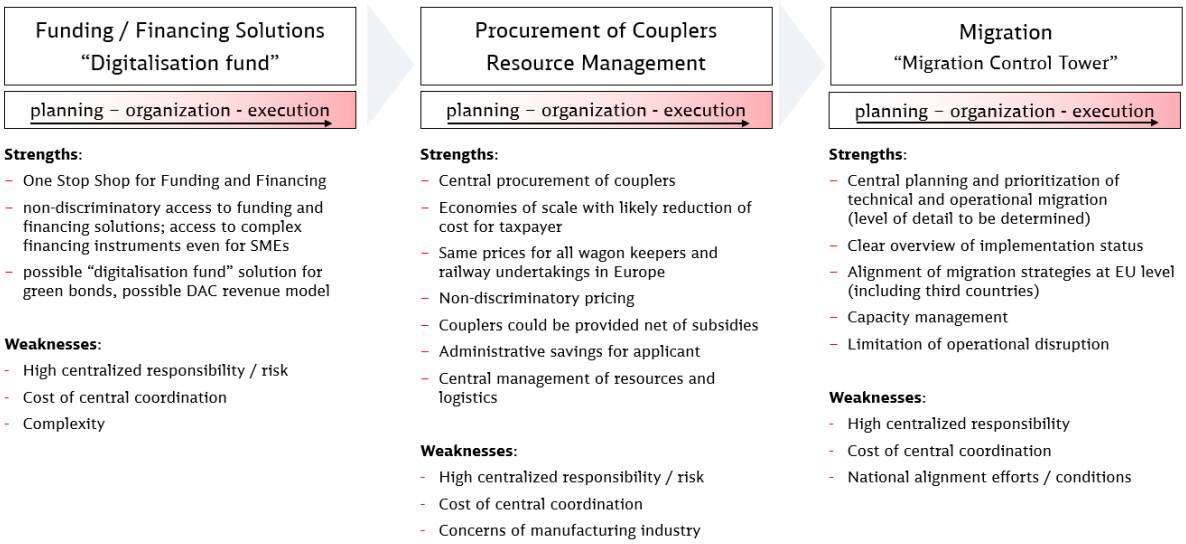


On the way to the deployment of DAC, a **multi-stage approach is likely to** make sense. For example, a distinction can currently be made between the current phase of "**pre-deployment"** with the milestone of the operation of up to 100 test trains with DAK in Europe from the end of 2026 and the phase of the actual "**deployment"** with the general roll-out planned from 2028**.** A basic framework of "deployment management" should be set up as early as 2024 in order to take on important tasks of coordinating the test trains, promoting and communicating. The following table gives an overview of the possible range of tasks:

Range of tasks of pre-deployment (to be set up at short notice)	
Topic	**Time of Setup**
Central information about pre-deployment trains	Q2 2024
Maintaining a network of contact points for pre-deployment trains	Q2 2024
Promotion of a pre-deployment projects with the aim of obtaining funding	Q2 2024
Communication about project status, project successes	Q2 2024
Clarification of authorisation of vehicles equipped with DAC couplers and components for test trains	2025
Development of a (central) funding model for the couplers and components	2025
Establishment of a risk management system for the test trains	2025
Procurement of couplings and components of DAC Basic Package	2026

5.2.3. What are strengths and weaknesses of a European unit for the Deployment of DAC ("DAC deployment management entity")?

All in all, the above results in the following structure for a European entity for the deployment of DAC. The advantages and disadvantages of central control of the individual tasks are evaluated in the following illustrations. In principle, different degrees of responsibility of the central European institution are conceivable for each subject area. These range from planning and organization to independent execution. The European Deployment Manager could be entrusted with important coordination and coordination tasks in the sector, thus avoiding delays, incompatibilities, and additional costs as in other European technology projects (see ETCS implementation). In the work of the structure, attention must be paid to the protection of commercial secrets and the protection of commercially sensitive information. The tasks and their evaluation could be organised as described below:



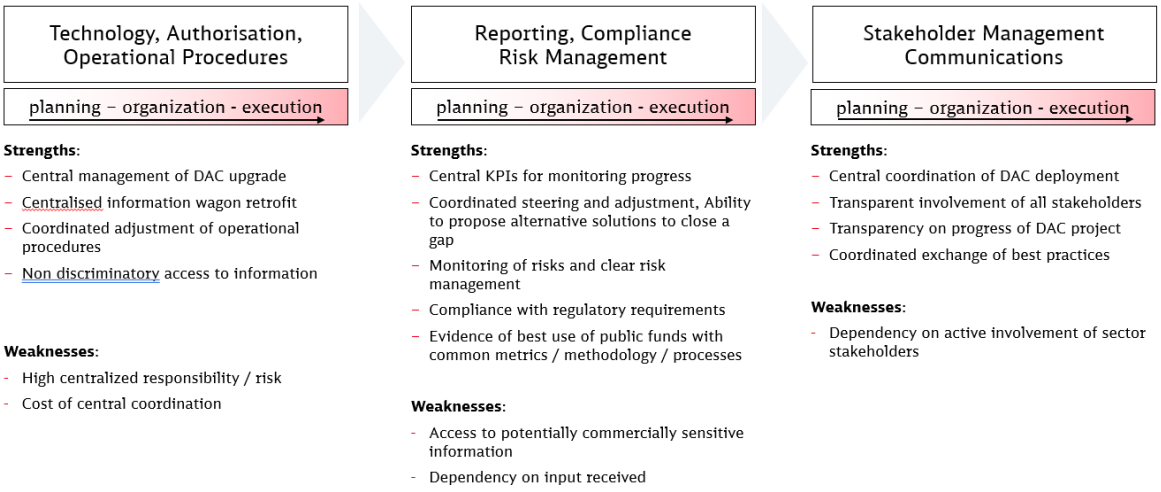


Illustration: schematic diagrams prepared by the author.

The precise allocation of tasks must be carried out on a case-by-case basis between the advantages and disadvantages of centralisation and decentralised implementation in individual companies and Member States. Centralisation can lead to higher efficiency and lower costs in certain cases, but as such it is associated with costs for carrying out the central tasks and concentrating responsibility in one place. With regard to the centralised coordination of promotion/financing/procurement and the management of migration, the sector assumes that the added value of centralised management significantly outweighs the associated costs. It is expected that the central procurement of the technology will facilitate the deployment and allow for economies of scale.

Recommendation

Task	Level taking the Lead			
	Member State	Deployment Manager	Europe's Rail JU	European Commission
Funding / Financing	- national funding schemes	+ + One Stop Shop Digitalisation Fund	-	-
Procurement / Resource Management	-	+ + Central Procurement Central Resource Management	-	-
Migration	- National Migration Strategy	+ + Migration Control Tower	-	-
Technology, Authorisation, Operational Procedures	- National wagon database	++ Central wagon database, coordinated operational procedures	-	-
Reporting, Compliance, Risk Management	-	++ Project monitoring	-	-
Stakeholder Management, Communications	-	+ Project overview	+ Full sector involvement	-

Illustration: schematic diagram prepared by the author.

5.2.4. What is the adequate legal basis for a European "DAC deployment management entity?

There are various options for the legal basis of the deployment manager. First of all, the legal form is independent of the number of employees to be employed in the structure and the size of the annual budget. There is a wide range of possibilities: i) a sector initiative (public-private partnership, consortium) with the establishment of a non-profit association - for example, under Belgian law (association interationale sans but lucratif) with or without the participation of European institutions, ii) the use or extension of the legal basis of Europe's Rail Joint Undertaking (ERJU), iii) the use of a European executive or decentralised agency (e.g. CINEA, ERA) or the creation of a separate European agency for the purpose of DAC / rail technology deployment.

The choice of legal basis should take into account the possibility of associating third countries that are eager to deploy DAC and that form an integral part of the European rail freight network (such as Switzerland). This could be an argument in favour of choosing a consortium / association for the implementation.

A possible model for deployment management could be the SESAR Deployment Manager from the aeronautics sector, although in rail transport there is no equivalent for Eurocontrol as a European body, which plays an important role in the coordination of the sector in the SESAR DM. In rail transport, for example, this role could be played by the ERJU.

It should also be borne in mind that the structure has to manage **public funds**. This could have an impact on the **legal form to be chosen**, **in particular if a high share of European funding is involved.**

The **legal form may change** in the course of the programme, for example in order to be able to act even before the creation of a dedicated European legal basis. In this way, a consortium of the sector could be transformed into a European structure. The setting up of an association / consortium is expected to take 6-12 months, while a modification of an existing legal basis or the foundation of a new legal basis would take 3-5 years.

It appears that in the **short term**, the **most feasible option is the creation of a sectoral organization / consortium through the establishment of a registered association**.

Legal Basis for the DAC Deployment Manager (DDM)

Sector Organisation Example: GCU	Sector Consortium Example: SESAR DM	Joint Undertaking Example: Europe's Rail	EU Executive Agency Exemple CINEA
Legal form: registered association Legal basis: private consortium, non-profit association, registered association Steps / time required for the set-up: Incorporation and registration via law firm, drafting of articles of association / approx. 6-12 months	Legal form: Consortium Legal basis: Consortium Agreement / Commission Implementing Regulation of 3 May 2013 Steps / time required for the set-up: drafting of consortium agreement via law firm / adoption by ERJU / approx. 8-12 months	Legal form: Joint Undertaking Legal basis: Implementing Regulation of the EU Commission Steps / time required for the set-up: Submission of a proposal for a regulation by the EU Commission, approval of MS and Parliament / 3-5 years	Legal form: Executive Agency Legal basis: EU Regulation Steps / time required for the set-up: Submission of a proposal for a regulation by the EU Commission, approval of MS and Parliament / 3-5 years

5.2.4.1 Could the existing legal base of Europe's Rail Joint Undertaking be used?

The legal basis of Europe's Rail Joint Undertaking is the Single Basic Act (Council Regulation 2021/285 of 19 November 2021). Europe's Rail is mentioned in Titel IV starting from article 85 ff. The main focus of Europe's Rail Joint Undertaking is on "Research and Innovation". The development of "Demonstration projects" is explicitly mentioned in article 85. Article 90 describes the "scope of additional activities" and mentions under point (b): "activities directly linked to the Europe's Rail Joint Undertaking work programme". Additional activities such as deployment management for DAC should therefore a minima be covered by the ERJU work programme.

Article 97 refers to a "deployment group" which has the role to advise and to support the ERJU. It shall be open to all stakeholders of the sector. The ERJU published a concept paper for a deployment group on 3 May 2023.

The SESAR Joint Undertaking is also mentioned in the Single Basic Act (Titel VIII and Articles 142 ff.). There is no dedicated paragraph on deployment, either. However, in contrast to the ERJU, the "SESAR deployment phase" is explicitly mentioned in Article 142 (3, e). Article 143 explicitly refers to the objective of the deployment of new technologies „delivering SESAR solutions, which are deployable outputs of the SESAR development phase introducing new or improved standardised and interoperable operational procedures or technologies". The „deployment" is also mentioned in the „Scope of additional activities" under Article 147 e.

In conclusion, the Single Basic Act is much more explicite with regard to deployment when it comes to SESAR than when it comes to ERJU. However, there are elements in the legal basis of ERJU that could be used to start with the set up of a deployment management for ERJU, especially if this the deployment is limited to one technology developed by the ERJU and the budget is limited. The actions would at least have to be included in the ERJU work

programme. This might be a solution while in parallel, the legal basis for deployment management for technologies developed within the ERJU could be broadened in the next revision of the Single Basic Act. There can be not doubt that the objective of the European legislator was not only to develop new technologies for the rail sector within the ERJU, but also to deploy these technologies in Europe.

The concept paper of ERJU on the deployment group published in May 2023, suggests that the deployment group should advise and assist in the deployment of innovations. The goal set out on page 2 is to describe the "how" of rolling out the innovations and bringing them to market more quickly. That is precisely what is needed for DAC. On page 3 above, it is described what the Deployment Group's (DG) recommendations may include: mandatory or optional conversion, technical or operational considerations, timetable/coordination at European level, business cases, funding and financing models. Here, too, there are essential points that we are needed for DAC deployment. The DG should mobilise support for its recommendations from the Commission and the Member States. There will be a High Level Core Group and specific thematic groups. The thematic groups are intended to define a "deployment package". DAC is explicitly mentioned as an example of an upcoming project. The working groups are intended to be informal and non-funded, but specific studies/consultancy needs can be funded by the ERJU or through the members.

Option: start by using the existing legal basis
Use the existing legal basis of ERJU and the provisions on a „deployment group" within Europe's Rail Joint Undertaking as a legal basis to start with the set up of a European Deployment Management entity.

5.2.5. What could be timeline, budget and the next steps for setting up a European Deployment Management entity?

The foundations for "deployment management" could be built in preparation for the deployment of DAC in parallel with the completion of technical development and clarification of financing from mid-2024.

The development of a structure for deployment management needs the support of the European Commission (Communication, Master Plan), the EU Member States (Council Conclusions) and the European Parliament (Transport Committee "TRAN"). It must also be coordinated with the relevant third countries.

The budget indicated for the first phase of setting up the structure is estimated to €10M (cf. DAC Sector Statement from July 2023: €210M for the pre-deployment phase, of which €200M for the pre-deployment trains and €10M for deployment management). The pre-deployment phase is to start in 2026 with the launch of the pre-deployment trains and to take two years. The pre-deployment structure needs to be set up from the second half of 2024 and should be operational in 2025 in order to conduct the necessary preparatory works for the launch of the pre-deployment trains from end of 2026. The indicated budget is intended to finance the initial phase of the entity and will probably not be sufficient to cover the entire range of tasks to be fulfilled that are listed in chapter 5.2.2.

The next step could be to reach an agreement in principle on these basic features, combined with the mandate to describe the tasks of the Deployment Manager in detail on the basis of the above-mentioned structure and to coordinate them within the European Programme for the Deployment of DAC.

On this basis, the structure can then be built after the necessary budget has been provided. The first task for the structure will then be to coordinate the setup of projects for pre-deployment trains with the tasks described above.

6. Conclusions

This paper was drafted in the context of the European DAC Delivery Programme to **describe the requirements for the funding and financing mechanisms** to be developed for DAC deployment and to define **options** to fulfil them. It explains why a **European support for the deployment of DAC** is needed and why a **European entity** for the coordination of the Deployment of DAC is deemed necessary.

The paper recommends the to set up a **European deployment management entity** starting from 2024 to centrally steer the set-up of the pre-deployment trains. In a first step, the missions could be assumed by the ERJU. It appears that the entity that is to manage the pre-deployment trains should use a **simple legal basis in a first step** (e.g. non-profit association under Belgian law or Deployment Group of the existing ERJU) **in order to be set up rapidly** and that this **legal basis could be modified in the course of the programme**. Once it has proven its added value, it can extend its range of missions with the overall roll-out phase of DAC. It might even be useful for the deployment of technology projects in the European rail sector in general.

The document **does not provide a specially designed funding programme for DAC pre-deployment** or even DAC deployment as the identification of funding programmes and the provision of funds is subject to political support and approval. **Neither does it establish the legal basis for the deployment management entity**. However, it clearly demonstrates options for funding programmes and the need for the set up of a deployment management entity.

It appears that **funding for DAC deployment** must come from **different national and European sources**. In the short term, there is the need to set up a solution for the pre-deployment phase (funding needs estimated to 200M€) and the deployment management entity (funding needs estimated to 10M€). In addition, the set up of a sector-wide "**digitalisation and automation fund"** that uses additional sources of revenue such as carbon credits or revenues from the European Emission Trading system could be an option.

The next steps would now be to **draft a Call of ERJU for a deployment management entity** and to draft a **Call for a consortium to implement pre-deployment train projects** in Europe from 2026. The Calls should have a dedicated budget from EU sources and could be completed by national contributions and sector contributions.

7. References

European DAC Investment Plan, Final Report, 16/12/2022

Connected Value, DB / UIC project “FIN4DAC”, Final Presentation, January 2024

European DAC Delivery Programme, DAC CBA Consultation, 30/09/2022