International Labour Organization

# Tracking trends in Official Development Assistance toward green jobs and skills

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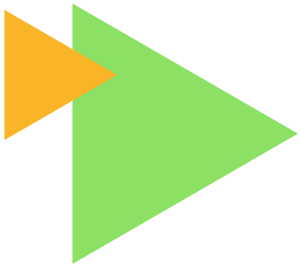

# Foreword

In a global context of accelerating climate and environmental change, the concept of a just transition has emerged as a process that maximizes the social and economic opportunities of climate action, while minimizing and carefully managing any challenges. The imperative of a just transition was cemented in the context of COP21 in the Paris Agreement of 2015, and with it, a recognition by parties that achieving net-zero emissions and sustainability goals requires addressing economic and social impacts through ensuring equitable processes and outcomes.

A decade on, national and global policies and strategies aimed at transitioning to sustainable societies are being formulated across the world, influencing global supply chains, trade dynamics, and labour markets. As regards the world of work, a central aspect of a just climate transition, policy and investment choices determine what and where jobs are created, where they are lost or transformed, and how such changes are distributed across regions. Policy and investment choices also bear on the level of access to new opportunities by different groups including vulnerable ones, and the extent to which decent jobs and their relevant skills sets are created or maintained and provide routes out of poverty.

As part of their commitment to accelerate progress towards a just transition, the Leaders of the G7 affirmed in 2022 their intent to "shape the transition towards net-zero, nature positive economies and societies in a manner which contributes to our objectives of achieving decent work for all, social inclusion, the eradication of poverty, and ensuring that no one is left behind".

**G7 Leaders group commitment (2022)**

*to increase, by 2025, the share of their country's official development assistance (ODA) employment and skills promotion programmes that is directed specifically towards green sectors and greening traditional sectors* in alignment with emerging and developing partner countries' strategies, and subject to G7 budgetary processes.

Following from these declarations made during the German presidency of the G7, G7 development ministers requested the ILO to support the tracking of this commitment made through the contributions of G7 partners Official Development Assistance (ODA) programmes that promote employment and skills development contributing to a green economy. An initiative was then developed, supported by a collaboration agreement between the German Federal Ministry for Economic Cooperation and Development (BMZ) through the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the ILO, that includes the development of a standardized tracking concept for G7 ODA commitments on "green jobs and skills for green jobs". The initiative also supports the development of an approach for monitoring and evaluation of G7 ODA programmes promoting "green jobs and skills for green jobs", and includes knowledge exchange and policy dialogues among G7 partners.

This baseline report 2022 was commissioned by the ILO in 2024 to analyse G7 partners' ODA trends. The underlying method for tracking the commitment was proposed by the ILO in 2023 as the basis for reporting. The respective tracking concept was agreed on collectively by the G7 and published by the ILO in the same year. It relies on the use of ODA statistics, compiled via the OECD's Development Assistance Committee (DAC) Creditor Reporting System (CRS). Data sets utilised in the present report are publicly available for all reporting countries up to 2022, which is the year of the G7 commitment.

While the target year of the G7 commitment is 2025, the results of this baseline report until 2022 show that G7 partners might be well on the way to achieving the commitment:

- The ODA commitments of the G7 for employment and skills promotion programmes directed towards green has increased to an average share of 31% in 2022. This is also meaningful since the share of green employment and skills promotion in global ODA (beyond G7) stood at only 12% in 2022. The notable increase for G7 may yet be an early realization of the G7 commitment, which was set to commence in January 2022.
- In spite of the COVID-19 crisis, which partly characterized the period under review, numbers suggest that the G7 partners' strategy might have been to use the crisis as an opportunity to 'build back

better' – combining the objective of securing jobs and at the same time intensifying efforts toward the green transition. The commitment to increase the share further until 2025 is particularly relevant in view of the growing needs to invest in both: more and better jobs and the green transformation. Thus, there still is high potential to scale up ODA for employment and skills promotion programmes that is directed towards green sectors and greening traditional sectors.

Moreover, the G7 have developed developed a solid base to further increase their cooperation, e.g. through knowledge exchange on green jobs and skills strategies, analytics and good practices as well as on respective donor coordination.

Looking ahead, reporting on the G7 commitment will move into focus. In 2025, the next comprehensive Progress Report will be published by the Canadian Presidency and the G7 Accountability Working Group (AWG). Because of the 2-years' time lag, at that point in time, OECD DAC data will only be available for years up to 2023. Joint reporting on the commitment's target year 2025 will be feasible only in 2027. Therefore, G7 partners are encouraged to report on the commitment's development in 2023, 2024 and 2025 by using national data. ILO can be requested to support the individual G7 partners accordingly as well as further joint reporting endeavors.

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# 1 Motivation, background, and objectives

# 1. Motivation, background, and objectives

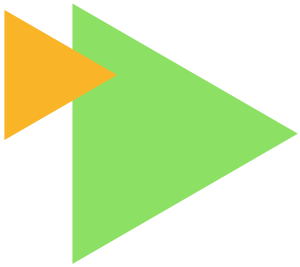
Climate change is the greatest challenge of our time. It is already causing death, loss of livelihoods and homes, destruction of ecosystems and economic damage, and if we do not take action to reduce greenhouse gas emissions, the consequences will be even more severe. The international community has committed to addressing the climate crisis. In 2015, countries signed the Paris Agreement, which commits them to reducing their emissions so that temperatures do not rise above 1.5°C relative to the pre-industrial era. The latest Intergovernmental Panel on Climate Change (IPCC) report suggests that the current efforts underway will not be enough to get the world on track with this goal. A key challenge is to achieve a fundamental transformation of our economies, decoupling economic growth from carbon emissions.

In view of this challenge, the leaders of G7 countries, at the summit in Elmau in June 2022, committed to promoting greening jobs and skills. Besides measures to green their own economies, the G7 has been seeking to support global efforts toward green jobs and skills—through the provision of Official Development Assistance (ODA) targeted to greening these sectors. The G7 Leaders Communique from 28 June 2022 reads: "By 2025, we will increase the share of our ODA employment and skills promotion programmes that is directed specifically towards green sectors and greening traditional sectors, in alignment with our emerging and developing partner countries' strategies and subject to our budgetary processes." A G7 approach to measuring ODA towards 'green jobs and skills' was outlined in 2022/23 and it is herewith being developed further.

The overarching aim of this project is to refine and implement approaches to track ODA flows toward employment and skills promotion programmes directed towards green sectors and greening traditional sectors, thereby enabling the G7 to assess compliance with its commitment to support this area of development cooperation. These flows relate to activities that either promote the creation of jobs and skills in green sectors and of jobs and skills involved in the greening of traditional sectors. A previous phase of this project laid out the potential methodological options towards tracking ODA in 'green jobs and skills' promotion programs (Sekmokas 2023), which were in principle approved by the G7 at its November 2022 meeting in Berlin. Part of the options was the introduction of a new key word covering ODA for 'green jobs and skills' promotion in the reporting framework of the Organization for Economic Development Cooperation (OECD), which was discussed at the Donor Assistance Committee (DAC) in 2023. However, the keyword approach was not pursued further as its implementation posed too many challenges to the G7 (and possibly other ODA providing) countries. Instead, the original option of identifying relevant ODA flows based on a combination of two ODA core dimensions reported in the Creditor Reporting System (CRS): purpose codes, which uniquely classify an aid activity into one sub-sectoral category, and five 'green' policy markers (including the four Rio markers—biodiversity, climate adaptation, climate mitigation, desertification—and environment), through which reporting donors orient their aid activities towards 'green' objectives.

Building on this initial conceptual work, the present paper pursues two objectives:

1. To review and (if necessary) refine the initial approach developed to date, and present contextualized ODA data trends, and recommendations for the G7 on conducting their own reporting subsequently.
2. To explore a complementary or alternative approach supported by Large Language Model analysis.



# 2 Overview of concepts, data, and methods

# 2. Overview of concepts, data, and methods

Employment and skills promotion activities seek to address unemployment, underemployment, and lack of relevant skills in the workforce. Following from an 'integrated approach', these activities address supply-side constraints, demand-side issues, matching problems in the labour market as well as framework conditions. Respective ODA interventions in partner/member countries can be at the micro-level, the meso-level, and the macro-level, ideally based on analysis of binding constraints (BMZ 2023; GIZ 2021; ILO 2024; World Bank 2023).

Examples of types of activities under the banner of employment and skills promotion aid include:

- *Vocational training programs:* Providing training in specific trades or industries that are in demand in the local job market.
- *Support for education systems:* Improving access to quality education that equips graduates with the skills needed for the workforce.
- *Private sector development programs:* Promoting small and medium enterprises (SMEs) through promoting investments and technology transfer, as well as equipping individuals with the skills and knowledge to start and run their own businesses.
- *Policy support:* Formulation of national policies related to employment and skills, capacity-building of national institutions (national employment services, business development services), and public infrastructure supporting employment and skills

Hence, the understanding of employment and skills promotion in the framework of the G7 commitment and therefore in this study is broad, ranging i.e. from specific skills that are directly relevant for the job market to more general skills that have indirect benefits for employment generation. The emphasis of G7 partners is on 'green jobs and skills', which entails the development of jobs and skills in environmentally sustainable sectors as well as the development of jobs and skills involved in the 'greening' of traditional sectors. Taken together, these activities seek to contribute to achieving 'SDG 8: Decent Work and Economic Growth' and, by extension, 'SDG 4: Quality Education'. The key aspects of SDG 8 include full and productive employment, inclusive and sustainable growth, decent work for all, and equal opportunities (UN 2015).

In this note, we refer to 'green aid' as all the bilateral ODA activities with a specific environmental focus. It aims to promote environmentally and ecologically sustainable development, including through renewable energy, climate change mitigation and adaptation interventions, biodiversity protection and conservation efforts, and sustainable agriculture and resource management (Hicks et al. 2008). This definition is operationalized in OECD/DAC statistics through a set of five 'green' markers, corresponding to biodiversity, climate adaptation, climate mitigation, desertification, and the environment—as described further below.

To track its commitment in support of green jobs and skills, the G7 considered two sets of approaches, further developed and operationalized in a technical concept paper commissioned by the German Development Corporation (Sekmokas 2023). The first was a long-term approach that entails the introduction of a new 'keyword' in the OECD/DAC statistical data. The keyword approach was abandoned as it would have involved too many challenges for reporting donors.[1]

The second approach is an 'interim approach' to tracking green jobs and skills promotion ODA using a combination of CRS purpose codes and green markers which are already available in the CRS. The target indicator is computed as the volume of 'green' ODA for employment and skills promotion oriented toward 'green' objectives through green markers, divided by the total volume of ODA for employment and skills promotion. The benefit of this approach is that the data are readily available, with broad coverage for all donors and back in time. However, the approach is static, pre-assigning specific purpose codes to the relevant ODA flows. The resultant measure is relatively crude because it assumes that all activities under a given purpose code are relevant. Moreover, the measure could change depending on the scope of ODA activities that are deemed relevant for employment and skills

1 A similar approach would be to use the SDG marker in the CRS data to identify activities relating to SDG 8. However, only four donors report on the SDG focus of their ODA, making this alternative approach infeasible (Sekmokas 2023, 11).

promotion. The G7 agreed that their main commitment should include purpose codes that are directly relevant for employment and skills promotion. An optional reportable measure would further include purpose codes relating to employment-relevant infrastructure.

An additional approach might be possible based on advances in text-as-data methods that promise to offer a dynamic approach to identifying (green) jobs and skills promotion ODA activities. The benefit of these methods is to build off the project description. A simple approach would utilize a pre-defined dictionary to identify relevant ODA activities. The advantage of dictionary methods is their simplicity, which makes its results intuitively understandable. However, results may be sensible to the dictionary being used, and a fixed dictionary is unable to capture evolving understandings of green jobs and skills over time. More sophisticated text-as-data methods rely on large language models, which have been popularized through applications like ChatGPT. These models have already proven helpful for encoding structured data from textual information in real-world applications (Gmyrek et al. 2024). While such models are dynamic, which helps them to learn newly-emerging concepts that are relevant for (green) employment and skills promotion, they are essentially black-box algorithms whose results are often not explainable.

In sum, different approaches are available to identify 'green' employment and skills promotion activities in ODA commitments. Each approach has peculiar benefits and challenges. For the most valid, reliable, and replicable measures of green employment and skills promotion ODA, we recommend using different methods and combining their results. We explain these methods—alongside the operational choices that they involve—in greater detail below.

## The interim approach: combining CRS purpose codes and green markers

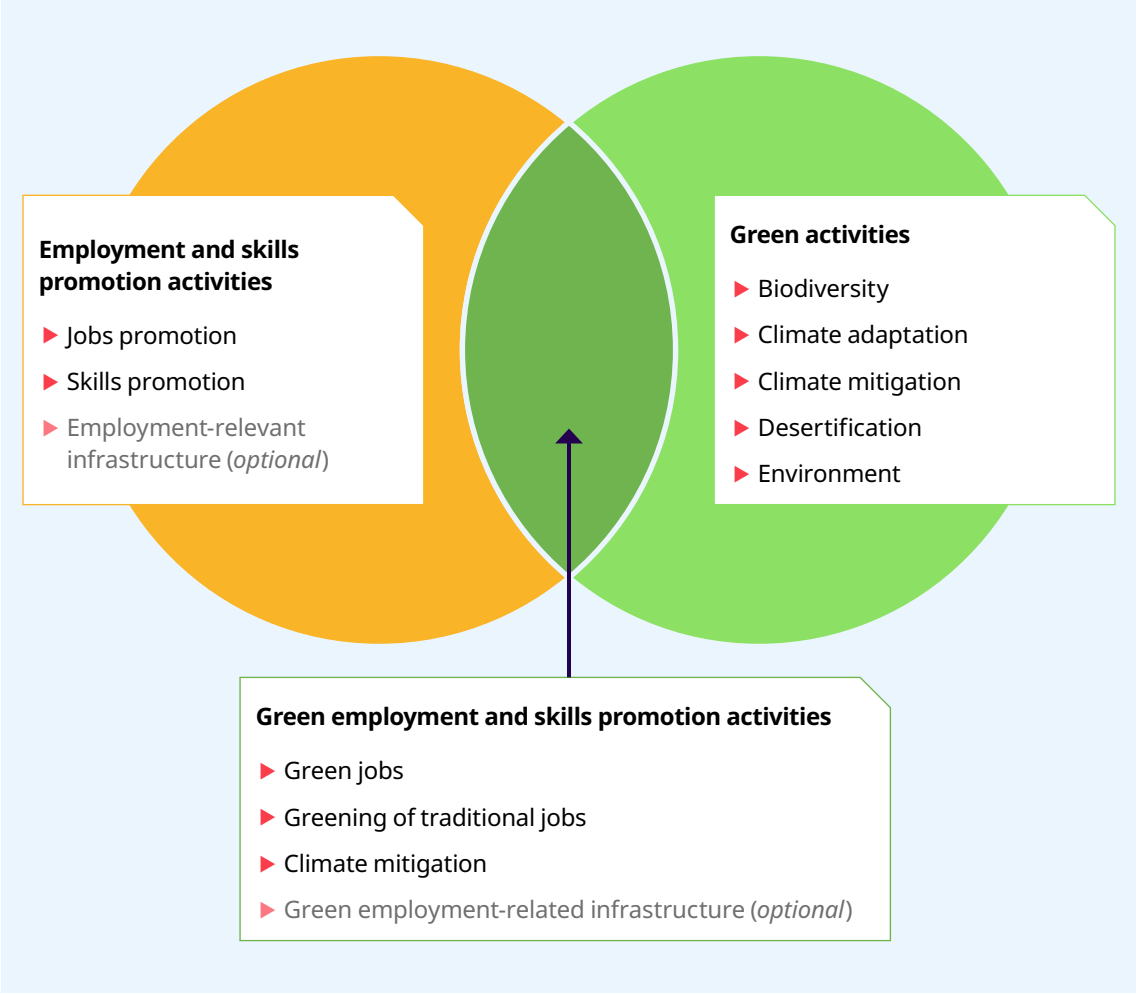
The 'interim approach' combines existing project-level information on sectors or purposes and a set of green markers to identify 'green' employment and skills promotion ODA. Both pieces of information are available in the CRS data. The target quantity is the share of employment and skills promotion activities that is 'green'. The denominator is based on all activities within a positive list of CRS purpose codes, listed exhaustively in Annex 1 of the input indicators paper (ILO 2023) and again in Table 1 below. For the numerator, only employment and skills promotion activities which are relevant for any of the five markers 'biodiversity', 'climate adaption', 'climate mitigation', 'desertification', and 'aid to environment' are considered.[2] An activity is considered 'green' if the green objective is 'significantly relevant' (level 1) or if green aid is the 'primary objective' (level 2) in at least one of the five markers. Figure 1 demonstrates the logic of the measure using a Venn diagram, in which the area of overlap refers to green employment and skills promotion activities and the red area denotes all employment and skill promotion activities.

Several operational choices can still be made for the target indicator, including whether to use commitments or disbursements; number of projects or total project amounts; activities for which green aid is the principal objective versus where it has (only) significant relevance; which donors, years, modalities, and delivery channels to consider; and which time periods to use for the assessment of progress toward the G7 goal (ILO 2023). Our default choice is to compute an annual measure, using aid commitments rather than aid disbursements as they more closely reflect donor intent. For the purpose of tracking the G7 target, disbursements would be more relevant because only money disbursed can make an impact. We will therefore examine disbursement-based ODA shares in additional tests.[3] In general, we prefer aid amounts over the number of projects as the basis for aggregation, such that

2 From a historical perspective, the five green markers consist of the 'environment' marker (introduced in 1992) and the four Rio markers covering 'biodiversity' (introduced in 1998), climate change adaptation (introduced in 2010), climate change mitigation (introduced in 1998), and desertification (introduced in 1998). See https://web-archive.oecd.org/temp/2023-05-22/658061-rioconventions.htm.

3 An additional consideration is whether to report aid volumes in constant $ or current $. Constant $ are generally more appropriate for over-time comparisons as they adjust flows for inflation. Current $ reflect the commitment made by the donor at the time of commitment. In practice, the results presented in this paper do not yield different conclusions, especially when focusing on the most recent years (for which current $ and constant $ are identical given the choice of base year).

**▶ Figure 1. Set logic of the interim approach**




larger projects obtain more weight in the resultant share. This would only be problematic if green projects were systematically different from non-green projects, especially with regard to their per-dollar impact for the environment. To contextualize our findings, we compute the share for all 142 donors that report to the CRS dataset, before focusing on green employment and skills promotion aid from the 'G7 group' which consists of the G7 member states and the European Commission (EC).[4]

The choice of sectors has a considerable impact on the resulting green share of employment and skills promotion ODA. It is therefore no surprise that the sector lists underwent several changes during the G7 dialogue forum. Our working definition of relevant ODA sectors is based on the input indicators specification document from 6 July 2023, which details the approach. Following consultation with the GIZ, we added one purpose code (31381 – 'education and training in fisheries') as it logically complements the purpose codes already listed under skills promotion ODA but apparently was omitted. Table 1 provides the list of sectors used for the computation of employment and skills ODA. Table 2 lists the sectors relating to employment-relevant infrastructure, which would be added to the employment and skills sectors for the optional measure. Table 3 lists the five green markers.

4 The CRS allows us to track any ODA from the G7 group over which a G7 donor has direct control. This includes bilateral aid and multi-bi aid channeled through multilateral implementers but excludes core contributions to multilaterals. Including such contributions would require identifying employment-related outflows from relevant multilaterals and repatriating these flows to member states on a pro-rata basis. Such approach could be developed in future research.

### ▶ Table 1. CRS purpose codes for employment and skills ODA

| Employment promotion programs | |
|---|---|
| CRS purpose code | Activity title |
| 16010 | Social Protection |
| 16020 | Employment creation |
| 16070 | Labor rights |
| 16080 | Social dialogue |
| 240 (whole group of activities, except 24081) | Banking & Financial Services |
| 250 (whole group of activities) | Business & Other Services |
| 321 (whole group of activities) | Industry |
| 322 (whole group of activities) | Mineral Resources & Mining |
| 323 (whole group of activities) | Construction |
| 331 (whole group of activities, except 33181) | Trade Policies & Regulations |
| 332 (whole group of activities | Tourism |

| Skills promotion programs | |
|---|---|
| CRS purpose code | Activity title |
| 111 (whole group of activities) | Education, Level Unspecified |
| 11230 | Basic life skills for adults (adult education) |
| 11231 | Basic life skills for youth (adult education) |
| 11260 | Lower secondary education |
| 113 (whole group of activities) | Secondary education |
| 114 (whole group of activities) | Post-secondary education |
| 12181 | Medical education/training |
| 12281 | Health personnel development |
| 13081 | Personnel development for population and reproductive health |
| 14081 | Education and training in water supply and sanitation |
| 21081 | Education and training in transport and storage |
| 23181 | Energy education/training |
| 31166 | Agricultural extension (Non-formal training in agriculture) |
| 31181 | Agricultural education/training |
| 31281 | Forestry education/training |
| 31381 | Fishery education/training |
| 33181 | Education and training in trade |
| 41081 | Environmental education/training |
| 43081 | Multisector education/training |
| 43082 | Research/scientific institutions |

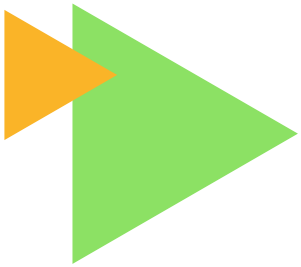
### ▶ Table 2. CRS sectors for employment-relevant infrastructure ODA

| Employment-relevant infrastructure investment | |
|---|---|
| CRS purpose code | Activity title |
| 12230 | Basic health infrastructure |
| 14020 | Water supply and sanitation - large systems |
| 14021 | Water supply – large systems |
| 14022 | Sanitation – large systems |
| 14031 | Basic drinking water supply |
| 14032 | Basic sanitation |
| 14050 | Waste management/disposal |
| 21020 | Road transport |
| 21021 | Feeder road construction |
| 21022 | Feeder road maintenance |
| 21023 | National road construction |
| 21024 | National road maintenance |
| 21030 | Rail transport |
| 23183 | Energy conservation and demand-side efficiency |
| 23210 | Energy generation, renewable sources - multiple technologies |
| 23220 | Hydro-electric power plants |
| 23220 | Water energy (Hydro-electric power plants) |
| 23230 | Solar energy for centralized grids |
| 23231 | Solar energy for isolated grids and standalone systems |
| 23232 | Solar energy - thermal applications |
| 23240 | Wind energy |
| 23260 | Geothermal energy |
| 23270 | Biofuel-fired power plants |
| 23410 | Hybrid energy electric power plants |
| 23642 | Electric mobility infrastructures |
| 31120 | Agriculture development |
| 31130 | Agricultural land resources |
| 31140 | Agricultural water resources |
| 41010 | Environmental policy and administrative management |
| 41020 | Biosphere protection |
| 41030 | Biodiversity |
| 41081 | Environmental education/training |
| 43031 | Urban land policy and management |
| 43032 | Urban development |
| 43050 | Non-agricultural alternative development |

### ▶ Table 3. CRS green markers

| Green markers and descriptions | |
|---|---|
| Green marker | Description of marker |
| Biodiversity | An activity that promotes at least one of the three objectives of the Convention on Biological Diversity (CBD): the conservation of biodiversity, sustainable use of its components (ecosystems, species or genetic resources), or fair and equitable sharing of the benefits of the utilisation of genetic resources (DCD/STAT(2018)25) |
| Climate change adaptation | The activity intends to reduce the vulnerability of human or natural systems to the impacts of climate change and climate-related risks, by maintaining or increasing adaptive capacity and resilience. This encompasses a range of activities from information and knowledge generation, to capacity development, planning and the implementation of climate change adaptation actions (DCD/DAC/STAT(2023)9/ADD2/FINAL). |
| Climate change mitigation | The activity contributes to the objective of stabilisation of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system by promoting efforts to reduce or limit GHG emissions or to enhance GHG sequestration (DCD/DAC/STAT(2023)9/ADD2/FINAL). |
| Desertification | The activity aims at combating desertification or mitigating the effects of drought in arid, semi-arid and dry sub-humid areas through prevention or reduction of land degradation, rehabilitation of partly degraded land, or reclamation of desertified land (DCD/DAC/STAT(2018)9/ADD2/FINAL) |
| Environment | Automatic marker if *purposecode*=410xx. When activity has relevance for biodiversity, climate mitigation, or desertification (as per green marker), aid to environment should be flagged too (DCD/STAT(2023)14). |

**Source:** To decide whether a green issue is a 'primary objective' in an activity arguably involves interpretation, but a key requirement is that the activity directly and explicitly addresses the criteria in the relevant description. The activity has the green issue as 'primary objective' if it had not been carried out without the green activity. To qualify for scoring as a 'significant objective', the green objective must also be explicitly stated, but is not the fundamental driver or motivation for undertaking and designing the activity.



# 3 Text-as-data methods and large language models

# 3. Text-as-data methods and large language models

We complement the above-mentioned approach with text-as-data methods. One such method is a dictionary method (Thorvaldsdottir and Patz 2019), which would consist in tagging projects which contain any of the keywords in a pre-defined list. This approach is intuitive to understand and easily replicable but could be problematic if benefits to green employment and skills are implicit or if there are relevant activities involving new technical terms outside the pre-defined list. Such a dictionary would include, for example, the following keywords: renewable, recyclable, clean, bio, eco, environmental, earth, or sustainable, as well as all topically related words (renewable energy or renewable materials, industrial ecology or ecological efficiency, biodegradation or biosphere, etc.) and should be built from domain-specific knowledge, such as in the context of OECD or G7 objectives.

A more sophisticated strategy builds on recent advances in large language models (LLMs). These models have large potential for the analysis and interpretation of textual data (Gmyrek et al. 2024). Based on rapidly expanding deep-learning architecture, the advantage of LLMs is their ability to read massive amounts of text data, thereby learning the statistical relationships between words and phrases. Importantly, this allows these models to acknowledge nuances in text. We thus propose a framework to match on "semantic similarity" using LLM word embedding models. Table 4 provides a glossary of the main terms and concepts related to the text-as-data approaches discussed in this report.

These matching approaches between datasets have been shown to be effective when applied to structured data, such as the one reported in the OECD Creditor Reporting System (Prytkova et al. 2024). As in the methodology in Prytkova et al. (2024), we leverage the rapid increase in the capabilities of LLM tools to generate sentence embeddings through

**Table 4. Glossary of text-as-data relevant terminology**

| Glossary | |
|---|---|
| API | Application Programming Interface: set of tools that allows different software applications to communicate with each other. |
| Cosine similarity | A measure of similarity between two vectors in an n-dimensional space. |
| Embeddings | Numerical representations of words, phrases, or other entities, in a continuous vector space. |
| GPT | Generative Pre-trained Transformer: A type of LLM based on the transformer architecture. |
| Large Language Model | An AI model trained on vast amounts of text data to understand and generate human-like text. |
| Pre-training | The initial phase of training for a LLM, carried out on a large corpus of unlabeled data before fine-tuning it on a specific downstream task with labeled data. |
| Semantic similarity matching | The process of quantifying the similarity between two pieces of text based on their meaning and context. It involves comparing the semantic representations of the text as captured by their vector representation (embedding). |
| Text corpus/corpora | A dataset of digitized text. |
| Threshold | A predetermined value used to establish whether two pieces of text are considered similar or dissimilar, based on a computed similarity metric such as cosine similarity. |
| Transformer model | A type of neural network architecture primarily used in natural language processing tasks. The model is effective at capturing long-range dependencies and contextual information in text. |
| Token | A unit of text that has been segmented or divided from a larger piece of text, such as a sentence or document. |

pre-trained transformer models. Using a curated a set of green activities from major multilateral organizations engaged in green development activities, and matching these against CRS employment, skill, or employment-relevant infrastructure projects, we identify the green share of these CRS projects. We show the results for G7 countries between 2016 and 2022 at the donor-year level and compare it to the results obtained from the purpose code and green marker approach.

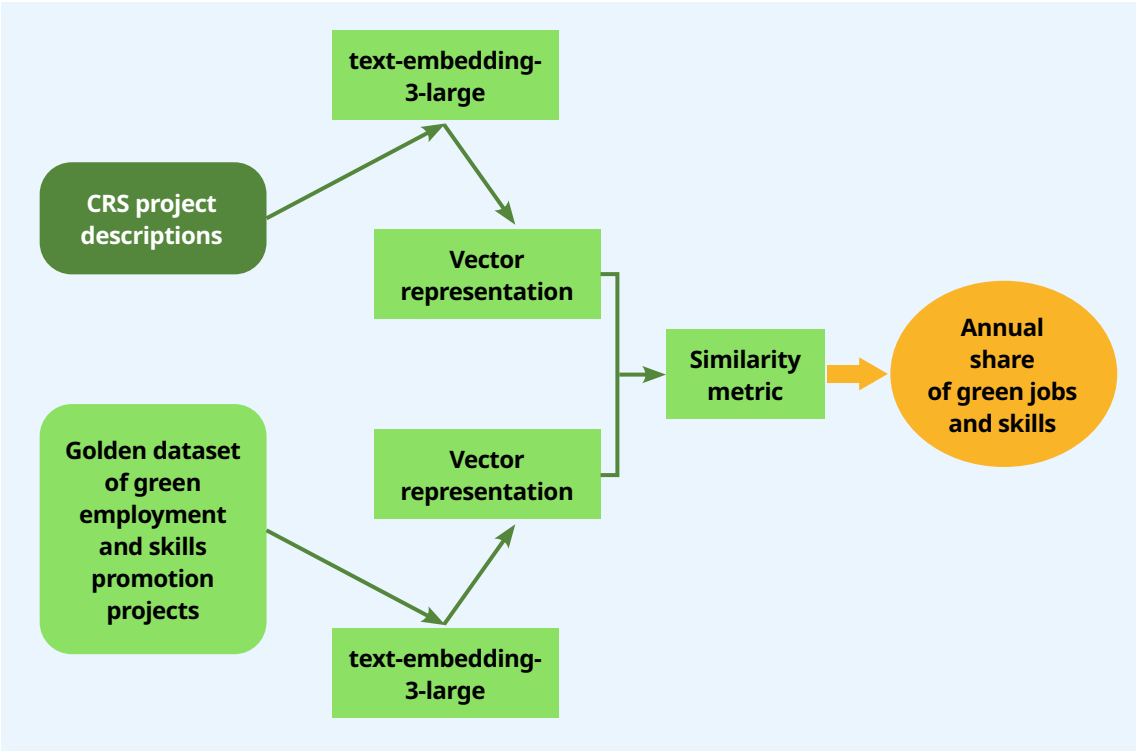
## Overview of implementation of LLM approach

The preferred LLM-based approach leverages recent advances in embedding models, and then uses these embeddings to classify CRS data as green employment and skills promotion based on donor-reported project descriptions. This method follows the approach from Prytkova et al. (2024), who use sentence embeddings to determine semantic similarity between a set of emerging digital technology patents and standard industry and occupancy classifications. Figure 2 visualizes the procedure for carrying out this approach.

The methodology illustrated in the figure relies on two specific tools. First, it uses domain-specific expertise from GIZ and ILO experts to create a dataset of green activities, as defined by the criteria in Figure 1, by selecting green projects from major multilateral organizations. This "golden dataset" serves as a reference against which CRS data is compared. The final output is the proportion of all employment and skills promotion activities categorized as green. The accuracy and reliability of this output are crucially dependent on the quality of this input.

Based on a small set of 150 validated projects provided by GIZ and ILO experts, we extend the “golden dataset” with a larger set of similar hand-selected green ODA activities obtained from the ILO Development Cooperation Dashboard, the World Bank, and the United Nations Development Programme. The golden dataset comprises over 1000 hand-tagged projects from donors engaged in green development initiatives. This broad dataset enhances the ability of the LLM to accurately classify activities as green, improving the robustness of our findings. Next, as an embedding method, we use a state-of-the-art model to transform our text data into their vector representations. Specifically, we

▶ **Figure 2. Stylized visualization of semantic similarity classification through embeddings**



use OpenAI's text-embedding-3-large model. The model requires access through a paid API priced at about $0.0001 / 1k tokens. These embedding models benefit from large-scale pre-training on massive text corpora, allowing them to learn nuanced semantic information and to generalize well to unseen data. Practically, these models handle syntax well across different languages, which is prevalent in the CRS data.

The model used is the latest generation embedding model from OpenAI and has several advantages with respect to standard models, such as text-embedding-ada-002. First, this newest model can create embeddings with up to 3072 dimensions, leading to notable improvement in its ability to capture semantic nuance. This model also does significantly better in standard benchmarking tests for embedding models. The average MTEB (a test used to evaluate precision) score is reported as 64.6, compared to 61 for text-embedding-ada-002. Importantly, the average MIRACL score jumps from 31.4 to 54.9.[5] This latter is a test set up to capture the model's performance with multi-language text, which is prevalent in the CRS. Therefore, such a significant difference in performance justifies the need for a latest generation model like text-embedding-3-large.

## LLM approach: strengths and limitations

The method has the advantage of being able to capture semantic similarity between text, therefore is less subject to nuance in the CRS project description. As an example, a standard dictionary approach might not classify a project described as "moving towards the low-impact development of the industry" as green-promoting, because it misses one of the core set of keywords typically associated to the process such as "sustainable" or "environmentally friendly", despite the nature of the project implying such an outcome. However, a pipeline like the one described in Figure 2 would be more likely to classify this CRS project as green employment or skills promotion.

The methodology outlined would have two limitations in terms of implementation and results. First, the quality of CRS project titles and descriptions may vary over time and by reporting donor countries. This will affect the matching algorithm's ability to accurately assess the CRS text and classify it accordingly. In the time dimension, reporting quality has improved over time, meaning matching would be more accurate between 2010 and 2020 than between 2000 and 2010. Appendix figure A20 shows this by plotting the total amount of tokenizable text per year. This measure is a proxy for the quantity of usable text in an LLM framework. It is clear from the figure that prior to 2008, there is little text information associated to CRS projects, thereby limiting the quality of an LLM approach on this sample.

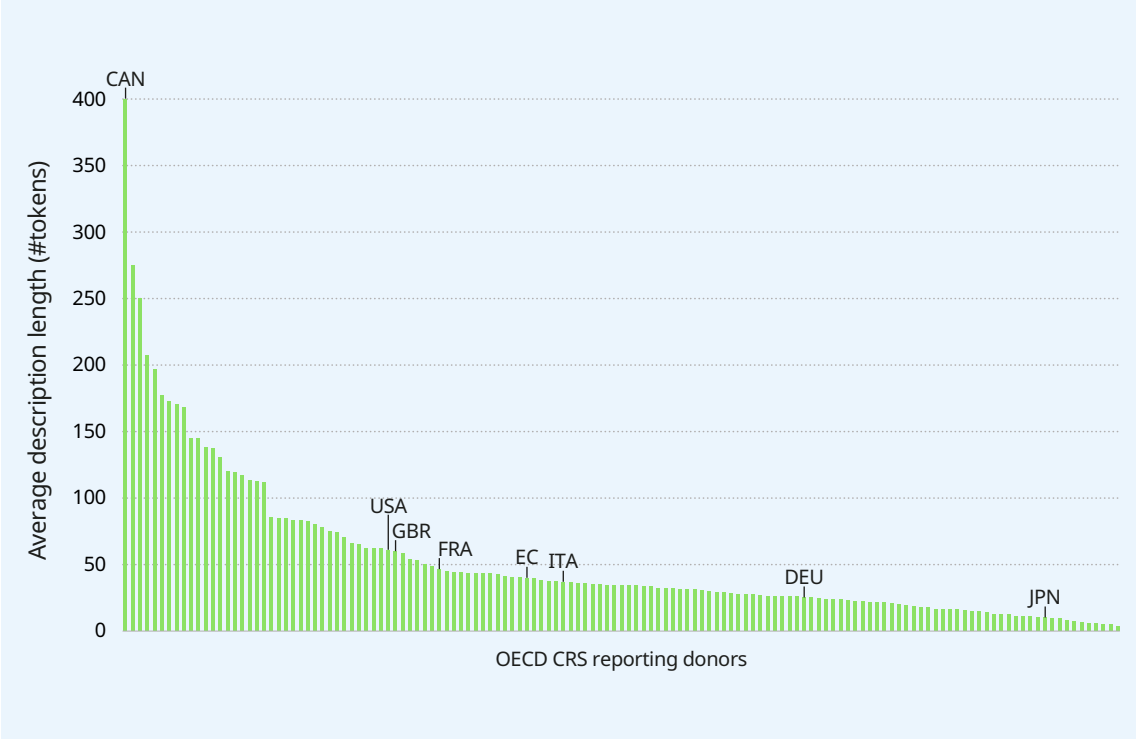
Across donors, the quality and reporting language of project descriptions can vary based on national reporting standards. Figure 3 below shows a measure of text quality in the CRS data. The x-axis reports (without displaying each name) all CRS donors with at least one non-zero commitment. The y-axis measures for each of these donors the average project description length in number of tokens. The figure shows there is a skewed distribution in the availability of text data in CRS project descriptions by donor, where on average most donor project descriptions are limited. Shorter project descriptions such as in the case of Japan may lead the model to underestimate the true share of green ODA. It is instead less likely that lengthy project descriptions such as for Canada bias the results, since the embedding models are calibrated to handle longer text.

Finally, with respect to the target metric, it should be noted that there is no systematic evaluation of how representative the CRS is of all donor development projects. This could lead to bias in both directions in the final reported statistics, as either employment-related or green-related (or both) activities could be underreported.

In the following sections, we now explain the step-by-step procedure for deriving our LLM-based measures of the share of green employment and skills promotion ODA.

5 A thorough discussion of these benchmarking test results and what they represent can be found on the OpenAI model guide page https://openai.com/index/new-embedding-models-and-api-updates/.

**▶ Figure 3. Data quality across OECD CRS donors – average number of tokens per project description**




**Note:** The x-axis shows all reporting donors ranked by the average length of their project descriptions in the CRS data in descending order.

## LLM approach: Generating embeddings

As a first step, we convert all relevant text into its respective vector representation, i.e., we generate embeddings. As illustrated in Figure 2, we do this for two sets of projects: the CRS sample we want to evaluate and the external, hand-tagged "golden dataset" to match against.

The CRS project sample is the same as the one described in the sector approach, selected based on CRS sector codes. Additionally, we focus on a subset of these projects. We consider only projects with non-zero commitment or disbursement value from the G7 donors and the EC, for years between 2016 and 2022. The embedding models are computationally intensive and operate on a pay-per-use basis; generating an embedding via API, even if it later proves irrelevant, will therefore amount to a sunk cost. Furthermore, the quality of text data from 2000 to 2015 in the CRS is low, as shown in Figure A20 in the appendix. A select set of projects from this described subsample are sufficient for an evaluation of the LLM method, as they are more representative of the sample.

For the CRS projects, we utilize both the short and long project descriptions of the text to capture the semantic nuance within project objectives. This is with respect to the project title, which is oftentimes either missing or unrepresentative of the project. Furthermore, the short description often mirrors the project title. In Table 5, we provide three examples of CRS project descriptions and titles to illustrate this. As can be seen, the various sources of text data (title vs descriptions) can convey different notions of what a project is about. In some cases, the information conveyed is the same (example 2), in other cases the long description provides a more comprehensive picture of the green objectives (example 1), and other times the title and short description give a clearer picture (example 3). For these reasons, we combine the short and long description into a single text and pass this to the embedding model. We call this the "composite" description of the CRS project.

For the sample of hand-tagged projects in the "golden dataset," we follow a similar approach.

▶ **Table 5. CRS project examples – raw data**

| ID | Project title | Short description | Long description |
|---|---|---|---|
| 1 | Global Alternative Tourism Network (continuation) | GLOBAL ALTERNATIVE TOURISM NETWORK (CONTINUATION) | The project promotes the implementation and promotion of responsible, alternative tourism among young people in Asia. It is based on the global network of YMCA-groups and focused on information sharing and awareness raising about the negative impact of climate change. (Non-LDC-Part) |
| 2 | Climate Change Education and Green Network in Asia Phase II, Continuation | CLIMATE CHANGE EDUCATION AND GREEN NETWORK IN ASIA PHASE II, CONTINUATION | Awareness raising in regard to environment and climate protection. Capacity building for multiplicators who will conduct own education initiatives within their own countries in Asia. (LDC-Part) |
| 3 | Setup of a Multi-Stakeholder-Partnership for Agro-Ecological Transformation in Senegal | SETUP OF A MULTI-STAKEHOLDER-PARTNERSHIP FOR AGRO-ECOLOGICAL TRANSFORMATION IN SENEGAL | The goal is to enable german NGOs and their local partners to implement development projects. |

In this case, we combine the project titles and the executive summaries, and refer to this again as the composite description. As in the case of CRS projects, the combination of the concise project titles and the more comprehensive descriptions allows us to capture semantic nuance that each piece of text independently does not. While longer descriptions allow for the model to pick up greater semantic nuance, it also increases the likelihood of distortions being introduced, while project titles or short descriptions may not be representative of the project's true nature.

Figure A21 in the appendix provides a visualization of the comparability of the different elements in this extended golden dataset. The figure plots the two-dimensional representation of the generated embeddings.[6] Each point represents a single project from the golden dataset, with different shading indicating the source. The plot shows that certain projects have greater spatial coverage over the plot area, meaning that there is a broader (vector) representation of green activities. Importantly, there is significant overlap between these different sets of projects, with no group being a clear outlier. In additional appendix figures, we evaluate the sensitivity of results to this extended sample.

## LLM approach: similarity between texts

Once the two sets of text data are converted into embeddings, we compute for each CRS composite project description $c \in C$ the similarity score with all golden-dataset composite project descriptions $i \in I$, according to a standard cosine similarity metric:

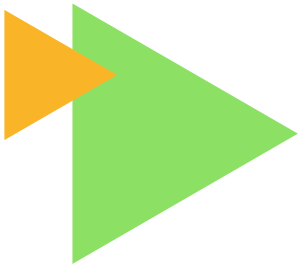
$$\text{Sim}_{c,i} = \frac{Emb_i \cdot Emb_c}{\|Emb_i\| \ \|Emb_c\|} \qquad \text{(Equation 1)}$$

Equation 1 returns, for each combination of CRS and golden dataset project, the cosine similarity between the embeddings of the two composite descriptions. In simple terms, this measure will return the degree of similarity between the *content* of two project descriptions, independent of the length. $Emb(i)$ and $Emb(c)$ represent the embeddings. We aggregate all similarity coefficients with golden dataset projects $i \in I$, for each CRS project $c$, through different summary statistics including the average or the maximum. The average measure reflects how much a project can be considered 'green'. The maximum instead classifies a project as green or not. We consider the average degree of similarity to fully exploit the variability in project descriptions.

6 The dimensionality reduction is carried out with Uniform Manifold Approximation and Project (UMAP) algorithm. The interpretation of the plot should be ordinal (relative to each other) rather than cardinal (absolute size).

Finally, we apply a threshold on the average similarity between a CRS project and all the golden dataset projects to classify a CRS project as green or not. The choice of threshold impacts the resulting share. However, there is no universally optimal or standardized value; the threshold depends on various factors including the context, the underlying text data, the embedding model employed, and heuristic guidelines applied during analysis. Given the large variability in the underlying golden dataset, we consider as 'green' those projects which are in the top quartile (75%) of the similarity distribution. Additional robustness exercises, such as reducing embedding dimensionality by clustering embeddings into groups, or the direct "compression" of embeddings could be explored in future analysis.

In the next sections, we present the results of both approaches. First, we provide the results from the sector approach. Then, we compare these results for G7 donors and the EC with an LLM approach.



# 4 CRS purpose code and green marker approach: key results

# ▶ 4. CRS purpose code and green marker approach: key results

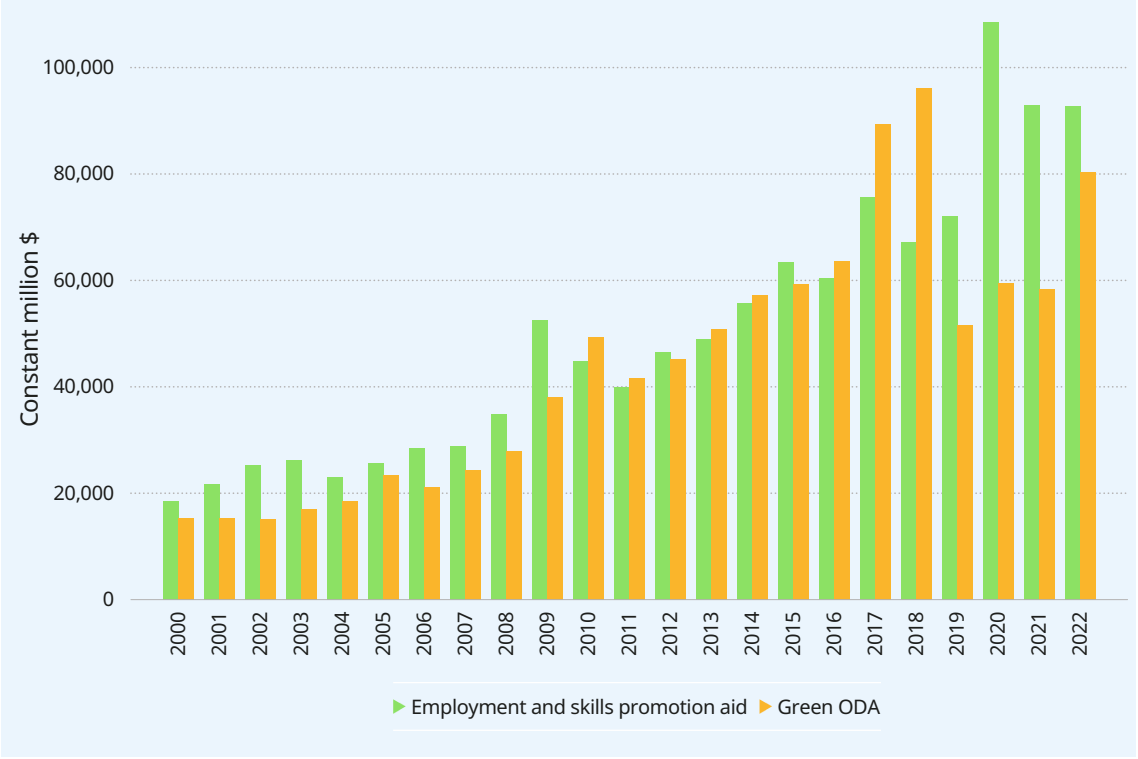
This section presents the results of the sector-based approach combining employment and skills-related ODA and green ODA. We begin by showing overall trends in these aid flows for all donors, which helps us to contextualize the subsequent analysis for G7 countries and the European Commission. We then provide disaggregated analysis for individual donors and demonstrate how they performed against the target. While it was not until the G7 decision in June 2022 that G7 donors agreed to track their 'green' employment and skills promotion ODA in subsequent years, we track the relevant green ODA share already in the period before the commitment.

## Overall trends and the role of G7 leadership

Figure 4 shows the total annual commitments in employment and skills promotion ODA and green ODA respectively for 142 donors that reported any positive ODA in 2000-2022. It is helpful to first look at these two ODA flows separately for context. For employment and skills promotion ODA, we use the narrow definition that includes ODA sectors relevant to employment and skills promotion but excludes employment-relevant infrastructure. We also present a separate calculation for employment-relevant infrastructure with green markers.

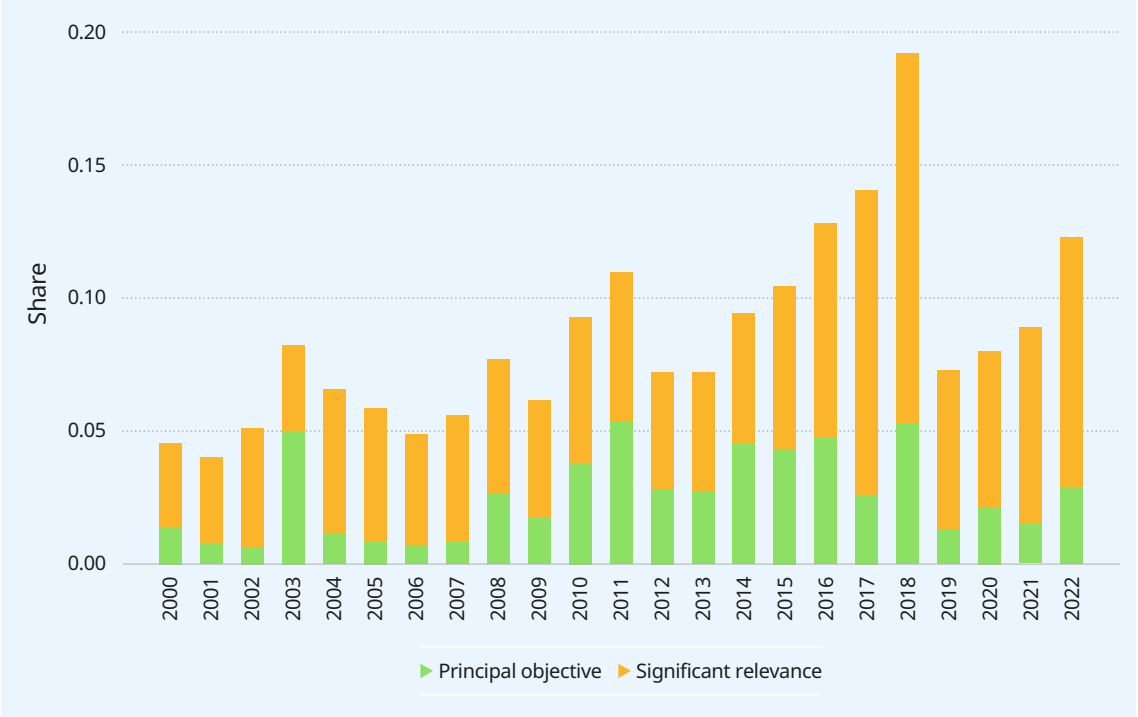
We find that—despite an overall increase in ODA—growth trends in ODA for employment and skills promotion and green ODA have diverged in the past seven years. Employment and skills promotion ODA has increased after 2015 and reached a peak in 2020 before stabilizing at slightly lower values. In contrast, green ODA has seen a discrete upward jump in 2017-18 and declined sharply after, to stabilize at an intermediate level in 2022. To mitigate the effect of potentially large discrete commitments,

▶ **Figure 4. Total annual ODA commitments by all reporting donors**




**Notes:** Employment and skills promotion aid refers to ODA commitments with a relevant purpose code (Table 1). Green aid refers to ODA commitments with at least one 'green' marker being present.

**▶ Figure 5. Annual share of green jobs and skills promotion ODA**




**Notes:** The bars represent the share of employment and skills promotion ODA commitments that is 'green' as indicated by the presence of a green marker. Dark gray bars involve activities where any green marker indicates the green issue to be a principal objective of the activity. Light gray bars involve activities where any green marker indicates the green issue to have significant relevance in the aid activity.

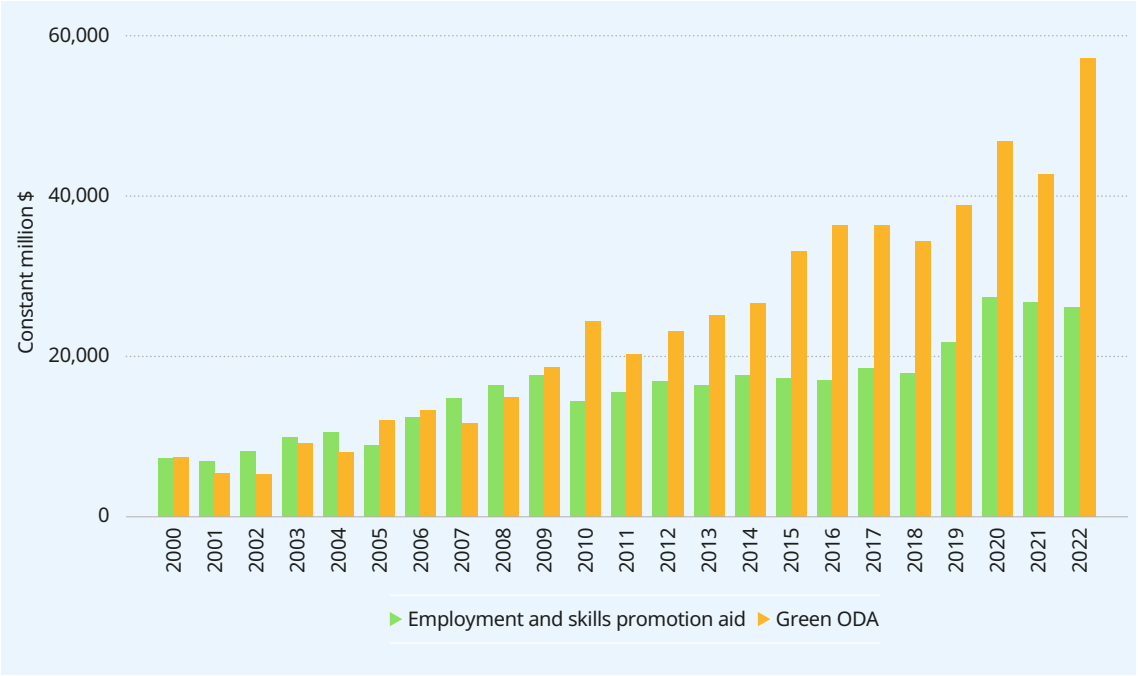
we also consider disbursements, for which we find similar patterns (Figure A1).

The green share of employment promotion has declined in recent years for the donor community—from about 17% in 2018 to 11% in 2022 (Figure 5). A likely explanation for these patterns is that employment promotion became the global top-priority after Covid-19. However, the increased focus on employment possibly appears to have come at the expense of green aid, amidst pressures on overall aid budgets. In the appendix, we provide the green share in employment-related ODA based on disbursed amounts (Figure A2) and the number of activities (Figure A3). We find qualitatively similar patterns for disbursement-based shares. Using the share of green employment and skills promotion projects in terms of the number of aid activities, we find that the relevant green ODA share is constant at about 14% in 2018 and 2022.

A different picture emerges for the G7 donors and the EC, whose ODA commitments have been increasing in real terms for both employment and skills promotion and especially for green issues. In 2022, the year with the latest available data, commitments to green ODA are as high as they have ever been (Figure 6). In terms of disbursements, ODA did not suffer from a Covid-19-related dip, possibly reflecting that pre-committed funds were disbursed even in those years (Figure A4). These numbers suggest that the G7 and EC strategy has been to use the Covid-19 crisis as an opportunity to 'build back better'—combining a commitment to promoting employment and intensifying efforts toward the green transition. In line with this interpretation, the share of green employment and skills promotion ODA increased by over 10 percentage points from its pre-pandemic level—from 18% in 2019 to 31% in 2022 (Figure 7). Much of this overall growth has come through projects with 'significant relevance' for green issues, although there were also more activities having green issues as their 'principal objective'.[7] This can be seen more clearly when expressing the share of green employment and skills promotion aid

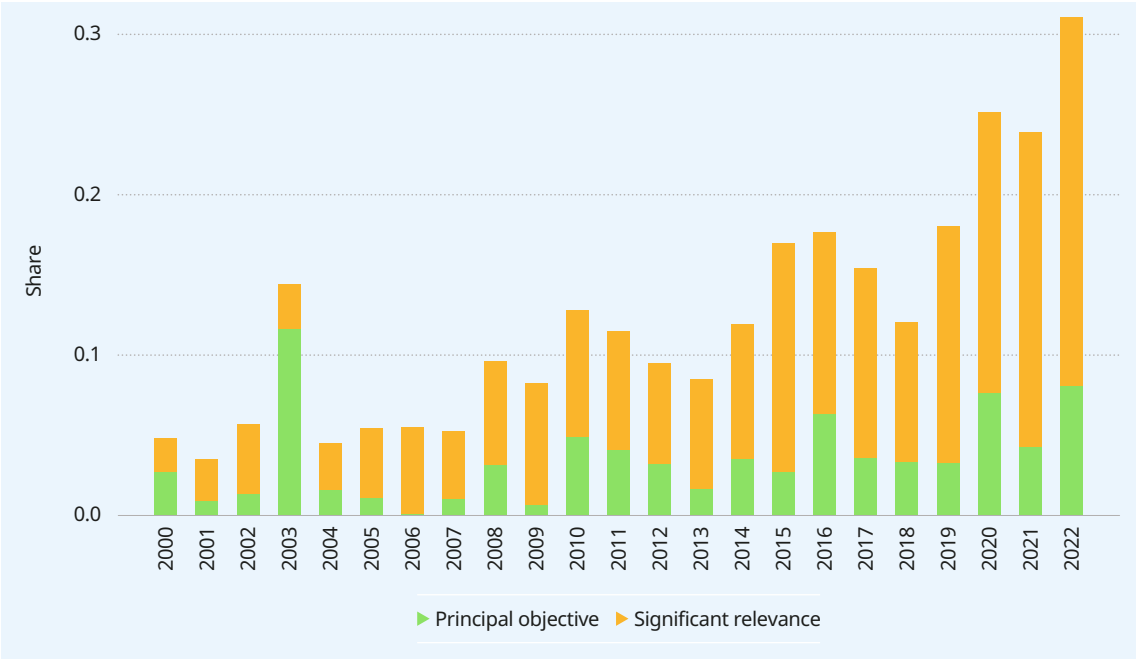
7 We follow the OECD/DAC terminology which distinguishes between activities whose principal objective is green, and activities where green issues have significant relevance but the activity has its primary goal in another sector.

### ▶ Figure 6. Total annual commitments by G7 donors and European Commission




**Notes:** Please see figure 4 above for notes. The graph includes ODA commitments from the 'G7 group', comprising the G7 countries and the European Commission.

### ▶ Figure 7. Annual share of green jobs and skills promotion ODA from G7 and European Commission



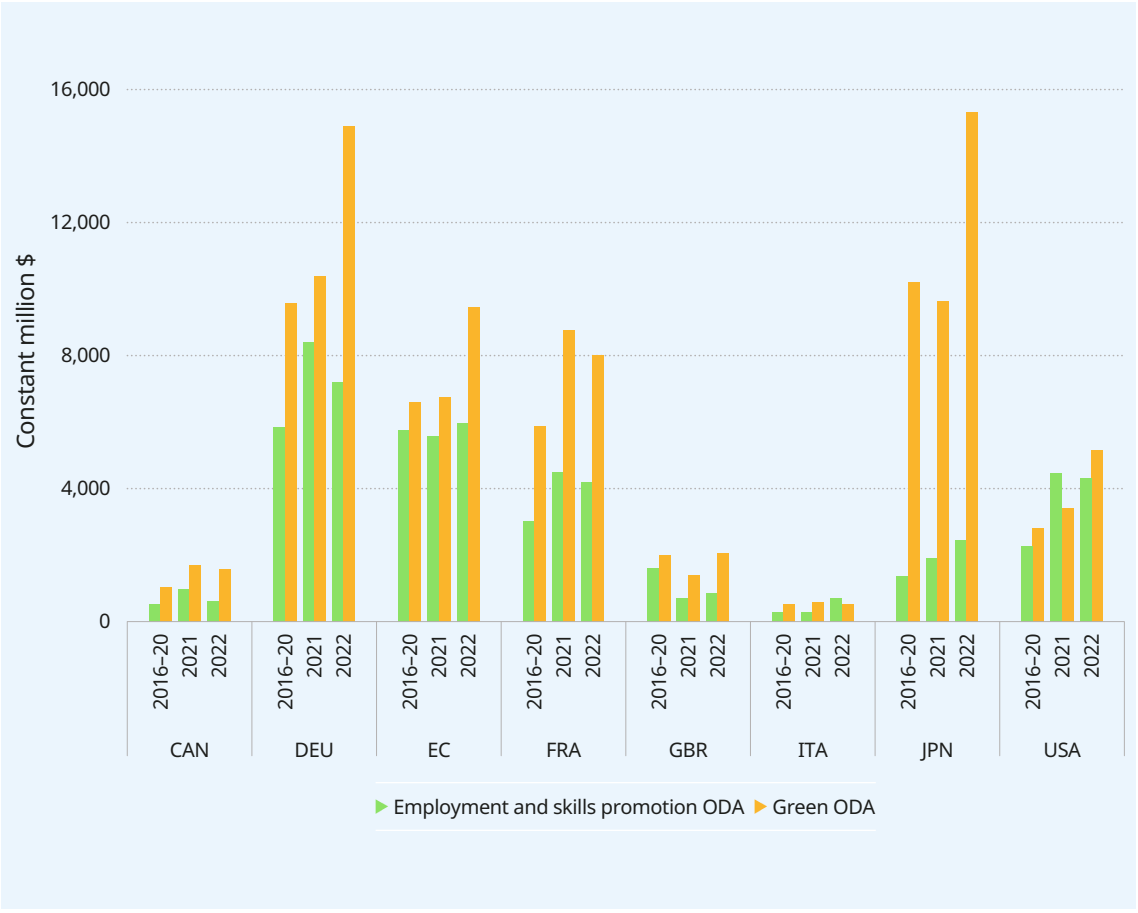

**Notes:** Please see figure 5 above for notes. The graph is based on ODA commitments from the 'G7 group'. The high green share in 2003 is an outlier, likely due to changes in reporting coverage for two donors. In particular, the US reported 18,000 aid activities in 2003 but only 7,500 aid activities in 2002. Japan reported 14,000 activities in 2003 but only 3,600 activities in 2002. As no other donors show similar increases in the number of activities in 2002-03, we believe that the two cases represent outliers in reporting coverage. If we were to drop the US and Japan from the set of donors, the green share of employment and skills promotion ODA would increase only from 0.06 to 0.07 in 2002-03.

in terms of the number of activities (Figure A5). The patterns reflect the increased emphasis globally on securing jobs after the Covid-19 shock which also was a policy concern for the G7. Importantly, compared to non-G7 donors, the G7 did not lessen their commitment to green issues.

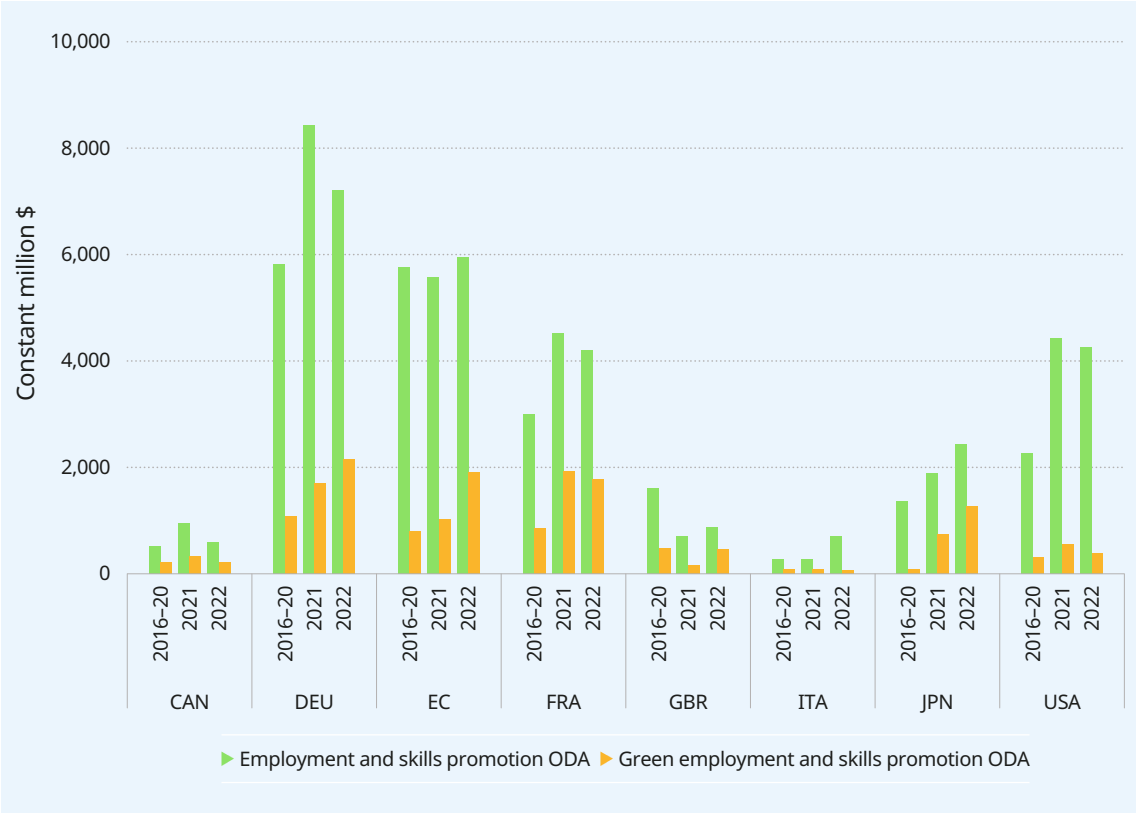
## Disaggregating G7 donors

As a next step, we analyze donor-disaggregated data on ODA for employment and skills promotion and green issues. Two sets of findings stand out. First, the G7 donors differ in the scale of their aid provided for these purposes. In 2022, in terms of aid commitments, Germany, the European Commission (EC), the United States, and France were leading on employment and skills promotion ODA. With respect to green ODA, Japan and Germany top the ranks, with about $15 billion in commitments each. The EC, France, and the United States follow at some distance. Second, G7 donors differ in the relative importance they attach to the two objectives. Canada, Germany, Japan, and the UK appear to focus considerably more on green ODA, whereas the EC, France, and the US provide somewhat more green ODA. Italy provides more employment and skills promotion ODA than green ODA (Figure 8). These patterns are similar when using disbursements instead of commitments, although here only Japan disburses significantly more green ODA than employment and skills promotion ODA compared to the other G7 donors (Figure A6). Overall, these graphs remind us of the size differences across donors: Germany is the largest donor when combining employment and skills ODA and green ODA, followed by Japan, and the EC. France has a similar combined ODA envelope as the EC but focuses comparatively more on green aid. The US provides surprisingly limited ODA in both sectors, although having a strong (and growing) presence in employment and skills ODA. The UK has stagnating ODA at best in both sectors, whereas Canada and Italy provide the lowest ODA amounts within the G7.

▶ **Figure 8. ODA commitments for different purposes by G7/EC donors over time**



**▶ Figure 9. Green and total employment and skills promotion ODA across G7 donors**

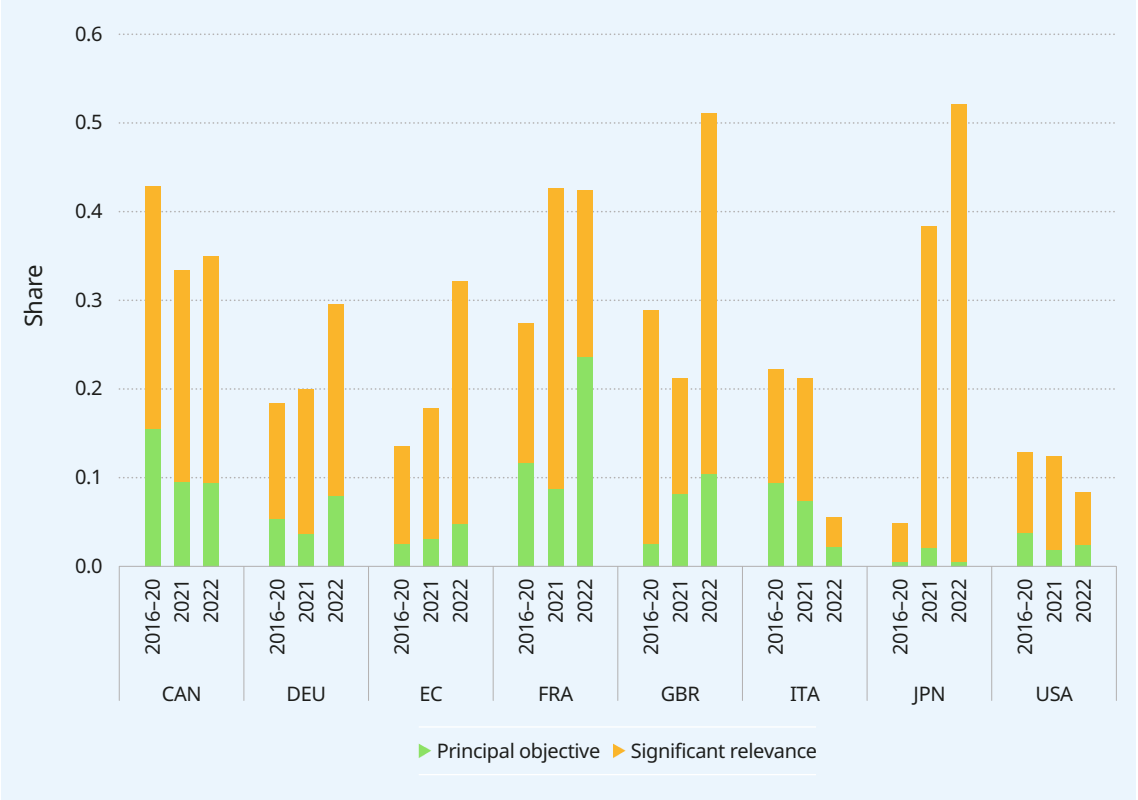



We now examine the extent to which employment and skills promotion aid is 'green' for different G7 donors. We begin with the analysis of aid volumes. For each G7 donor, we compute the average green ODA per year over a five-year baseline period (2016-20) and the annual green ODA for 2021 and 2022 using committed amounts. Figure 9 shows that Germany is the largest donor in terms of both types of flows, with over $7 billion in employment-related ODA in 2022 of which over $2 billion were green. The EC ranks second, with $6 billion in employment-related ODA in 2022 of which close to $2 billion. France spends a similar amount for green employment-related ODA, but its overall employment-related ODA is just over $4 billion. The US spends as much as France in total for employment-related purposes, but the green content of this spending is much less. Overall, the figure shows variation across donors, as well as different trends for specific donors over time. In the appendix, we plot the same figure using disbursements, which yields similar patterns (Figure A7).

Based on our analysis of ODA amounts, we can compute the green share in employment and skills promotion aid among the G7 donors. For each G7 donor, we again show the average green ODA share in the five-year baseline period (2016-20) and the annual green ODA share for 2021 and 2022. The shares are computed based on ODA commitment amounts (Figure 10).

The G7 donors diverge as to the evolving importance of green ODA for employment and skills promotion. Canada started from above 40% in 2016-20 but its green ODA share hovered at above 30% in 2021-22. Within relevant green ODA, the commitments for which green issues were a primary objective gradually declined over time. Germany steadily increased its green ODA share, albeit from low(er) initial levels. In 2022, the green ODA share was 30%, of which the lion share was for aid that had green issues as a secondary objective. The EC exhibits an even stronger growth in the green ODA share, but an even smaller content of this green EC aid has green issues as the primary objective. France has the highest share among all G7 donors where green ODA is the primary objective, although its overall green ODA share fluctuates between time periods and is at about 40%. The UK has one of the highest green ODA shares (51% in 2022) and a moderately high fraction of primarily green projects.

**▶ Figure 10. Share of green employment and skills promotion ODA by G7 donors**




Italy appears to have a low green ODA share in 2022, though its green share had long been stable at about 21%. Japan has massively increased its green ODA share, from below 5% in 2016-20 to over 50% in 2022—though almost none of this aid is primarily green. The US has reduced its green ODA share over time, now being below 10%. Looking across donors, donors with the highest green ODA shares in 2022 were Japan, the UK, and a group of donors with similar shares including Canada, Germany, the EC, and France. In terms of over-time trends, donors with consistent increases in green ODA shares were Germany, the EC, and Japan; Italy and the US had consistent decreases, whereas patterns for the other G7 donors were inconsistent.

To probe the stability of these findings against different measurement choices, we also compute green ODA shares based on disbursed amounts (Figure A8) as well as the number of relevant aid activities (Figure A9). The disbursement-based share forms the basis for benchmarking the G7 donors against their commitment to increase the share of green employment-related ODA.

Using *disbursement*-based shares, we find again that Canada, France, and the UK have the highest green shares in their employment-related ODA. For the latter two donors, the share of green employment-related ODA where green issues were a principal objective increased in the past two years compared to the pre-baseline period. In terms of time trends, Germany and the EC were the only donors to increase their green share of employment-related ODA, while other donors showed either declining shares or inconsistent patterns (Figure A8).

Using activity counts for computing green shares, we find that Canada tops the ranks, with about 44% of its activities being green. Germany is next, with a green activity share of 30% in 2022; the EC, US and the UK had green shares of around 20% in 2022. France and Italy occupy the middle-field, while Japan has the lowest share. These findings contrast sharply with the amount-based green shares, suggesting that Japan supports comparatively large green projects. Conversely, Canada appears to support small-scale green employment projects.

There are also marked differences across the emphasis on green issues within green employment projects. The US, the UK, Germany, and Canada have higher proportions of primarily green activi-

ties, whereas Italy, France, and the EC have lower proportions of primarily green projects (Table A9). A key takeaway is that—compared to the analysis involving ODA volumes—donors differ significantly in the types of activities they support when seeking to 'green' employment and skills promotion aid—some using systematically smaller projects while others using larger projects to advance these goals.

## Considering employment-relevant infrastructure

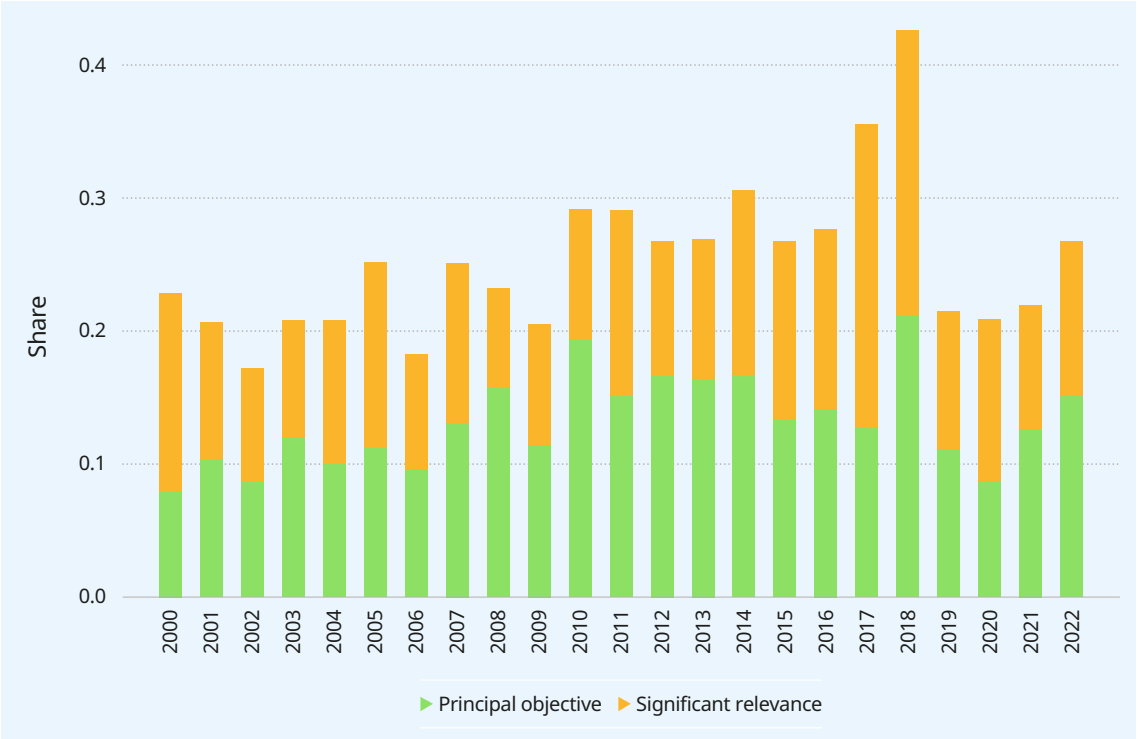
Our calculations so far were based on a narrow definition of employment and skills promotion ODA. A broader definition of such ODA would also include employment-relevant infrastructure. The G7 agreed that donors can optionally report a green ODA share that uses a broad denominator for employment and skills related ODA.

Figure 11 shows that the share of green employment and skills promotion ODA from all reporting donors—including employment-relevant infrastructure—has dropped in recent years, from 43% in 2018 to 27% in 2022. Yet, there has been a gradual increase in the share of primarily green ODA in recent years. Similar patterns emerge for disbursement-based shares (Figure A10) and when using the number of activities as the basis of computing the green ODA share in employment related ODA (Figure A11).

Before computing the respective shares for the 'G7 group', we examine ODA amounts for employment-related aid using the broader definition. Figure 12 shows that more aid is relevant for employment-related purposes, with annual ODA commitments being almost twice as high as under the narrow definition. However, the earlier conclusions from the donor comparison remain valid: Germany tops the ranking, but other donors provide similar aid magnitudes, notably the EC. Japan and France also provide significant amounts of employment-relevant ODA.

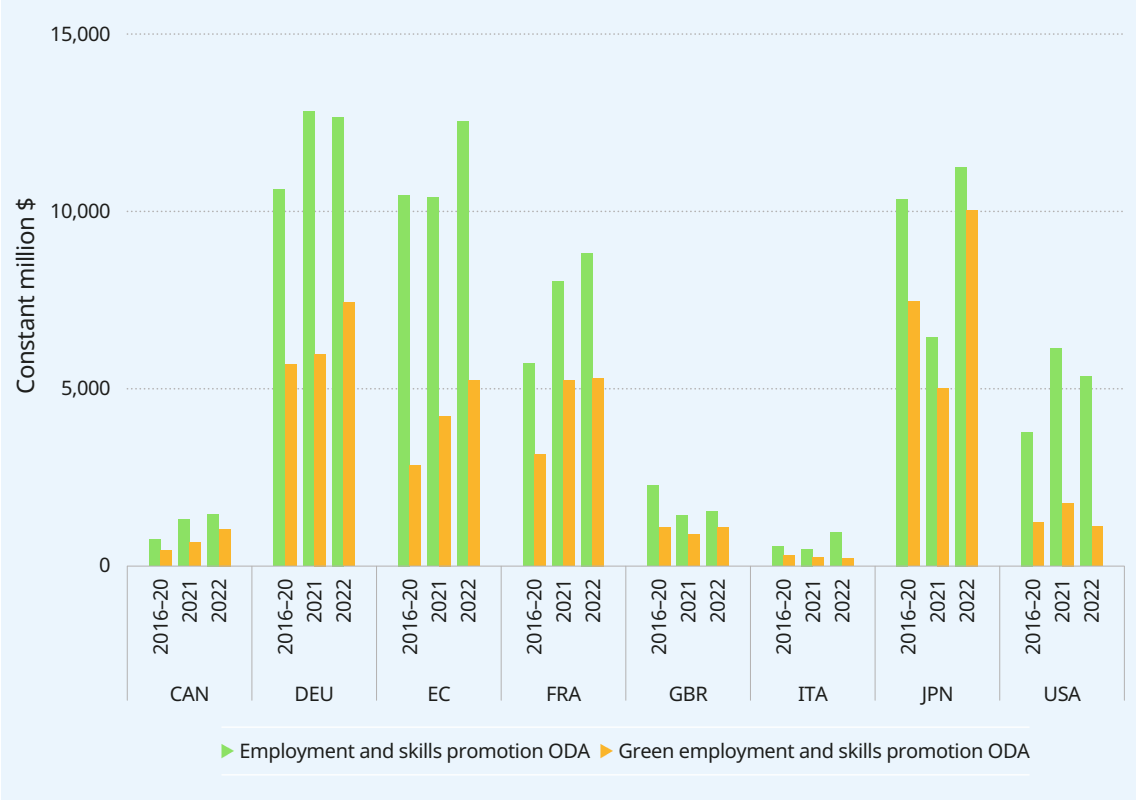
In addition, compared to the previous analysis using the narrow definition, the green content of employment-relevant ODA is consistently higher

▶ **Figure 11. Green ODA share of all reporting donors based on commitment amounts**




**Notes:** The bars represent the share of employment and skills promotion ODA commitments—now including employment-relevant infrastructure—that is 'green' as indicated by the presence of a green marker. The set of donors are all reporting donors.

**▶ Figure 12. ODA commitment amounts including employment-relevant infrastructure aid**



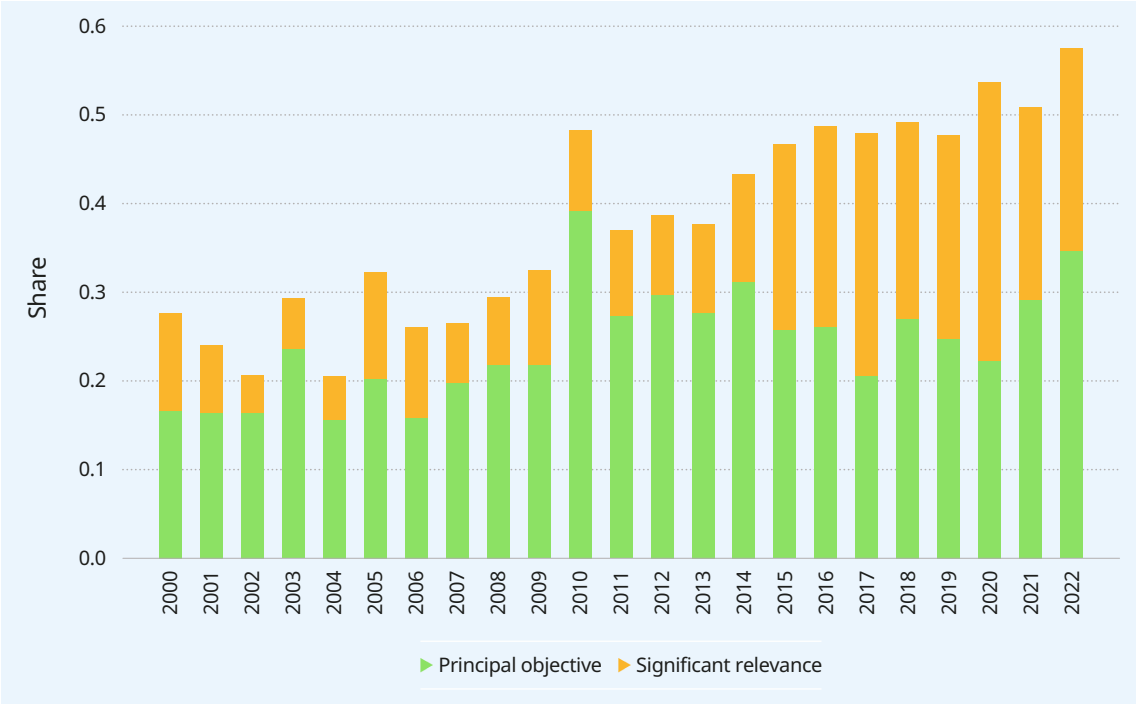

for all donors. This is most striking in the case of Japan, for which all employment-related ODA is green. France, Germany, and the EC—among the large donors—have high shares of green content, too, and their green shares have been increasing over time. Canada, albeit small in terms of size, has increased its green content faster than overall employment-relevant ODA. For completeness, we present the respective figures for disbursements in the appendix (Figure A12).

Contrary to all reporting donors, the 'G7 group' has collectively increased its commitment-based green ODA share over time, with marked increases occurring in recent years. The green share rose from 49% in 2018 to 57% in 2022 (Figure 13). Moreover, the G7 has slightly increased its commitments with primary emphasis on green issues.

It is too early to say if the recent increase in primarily green ODA is temporary or persistent. In the appendix, we plot the disbursement-based green share of employment-relevant ODA. We confirm the patterns from the commitment-based analysis showing a gradual increase in the green share of employment-related ODA. The relative distribution between primarily green ODA and secondary green ODA has been fairly stable (Figure A13). In terms of the number of activities, the green share has steadily increased over the past decade—to reach about 42% in 2022—with a stable balance between primarily green activities and secondary green activities (Figure A14).

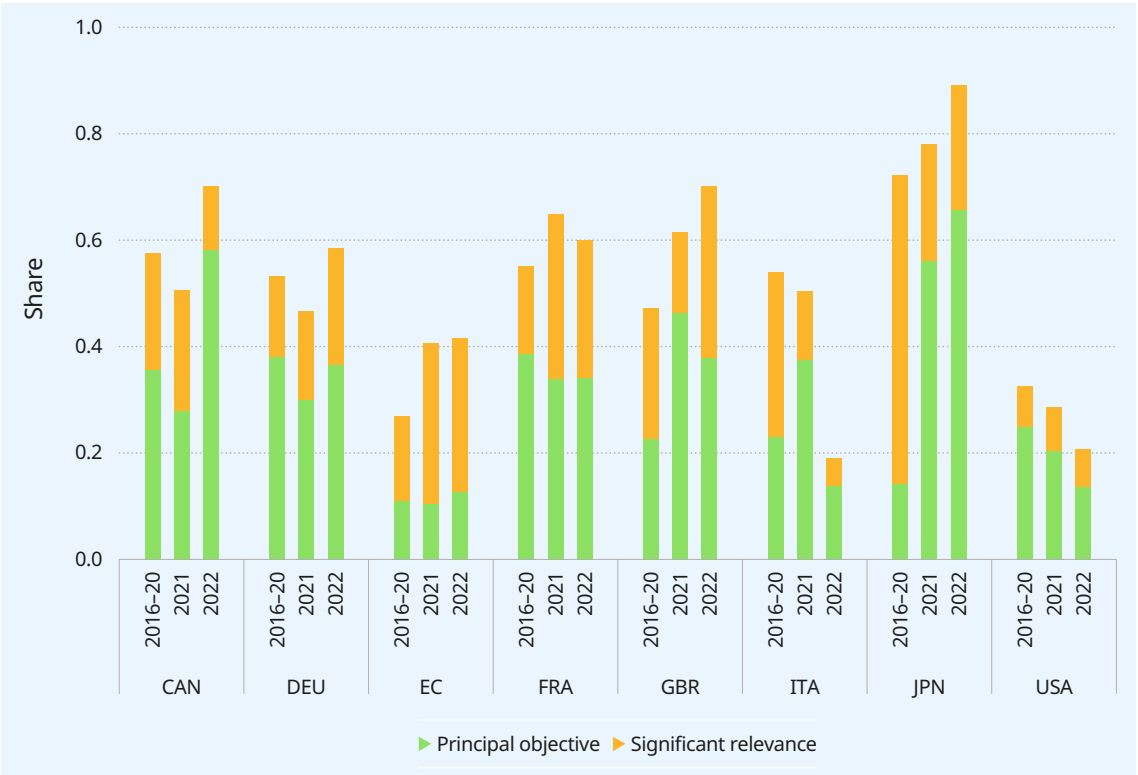
Looking at individual G7 members, we observe interesting variation (Figure 14). In terms of the overall commitment to green employment-related ODA, Japan stands out with a green share of 89% in 2022, starting out from already-high green shares in 2016-21. Canada had a green ODA share of over 70% in 2022, most of which being primarily green. The UK has also increased its green ODA share, reaching about 70% in 2022, almost half of which was primarily green. Other donors with over-time increases in the green ODA share are Germany (60% in 2022), and the EC (40% in 2022), whereas the US recorded consistent decreases in the green ODA share (now 20% in 2022). Italy shows the lowest green ODA share (below 20% in 2022), after shares well over 50% in the past. In the appendix, we plot green shares based on disbursements and the number of activities.

### ▶ Figure 13. Green ODA share of G7/EC donors based on commitment amounts




**Notes:** The bars represent the share of employment and skills promotion ODA commitments—now including employment-relevant infrastructure—that is 'green' as indicated by the presence of a green marker. The set of donors are the G7 donors including the EC.

### ▶ Figure 14. Green share of employment and skills related ODA including employment-relevant infrastructure by G7/EC donors over time based on commitments



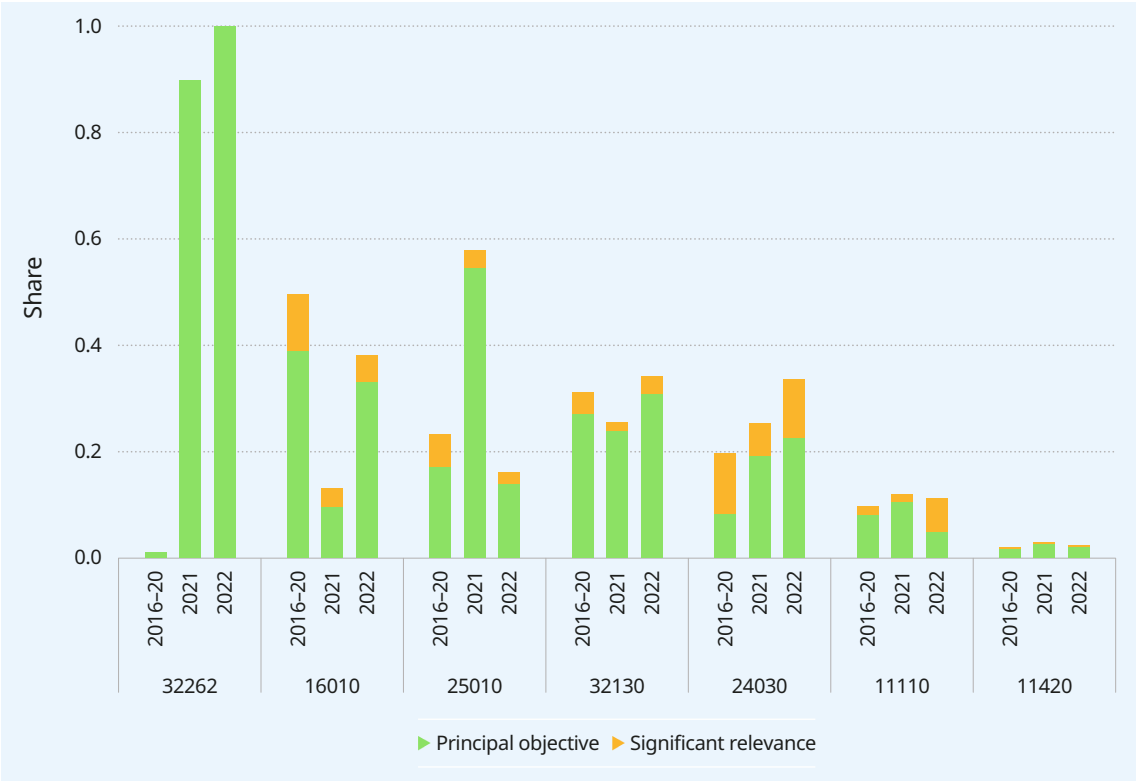
The disbursement-based shares look qualitatively similar to the commitment-based results (Figure A15). However, figures look different when considering the number of activities (Figure A16). The US records high—albeit consistently decreasing—green activity shares around 50%, while maintaining a high share of primarily green activities. Canada and Germany both have maintained green shares of about 50% or more, though Germany has a higher proportion of primarily green ODA activities. France, the UK, and Japan follow the ranks, with green activity shares of under 40%. The UK and Japan have maintained relatively high proportions of primarily green ODA activities. The EC has increased its green share gradually from 25% in 2016-20 to 38% in 2022. Italy is the only donor to remain slightly above 20% in 2022.

## Sub-sector analysis

Finally, we examine how important green issues are in the sub-sectors (equivalent to *CRS purpose codes*) that are most relevant to employment and skills promotion. The seven most relevant sub-sectors for employment and skills promotion in 2022 were (with their shares of total employment and skills aid in brackets): 'Formal sector financial intermediaries' (24030) (29%), 'Higher education' (11420) (16%), 'Household food security programs' (16010) (8%), 'Small and medium-sized enterprise (SME) development' (32130) (5%), 'Education policy and administrative management' (11110) (5%), 'Oil and gas' (32262) (4%), and 'Business policy and administration' (25010) (3%).[8]

We find differences across sub-sectors in the green share of ODA and the prioritization of green issues within relevant green ODA. It appears that oil and gas activities have become greener over time, with nearly all reported ODA having primary relevance

▶ **Figure 15. Contributions of specific sub-sectors to the G7 green target**

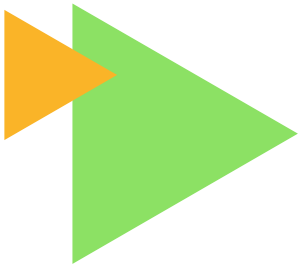



**Notes:** The graph shows the 7 sub-sectors that account for the highest share of employment and skills ODA.

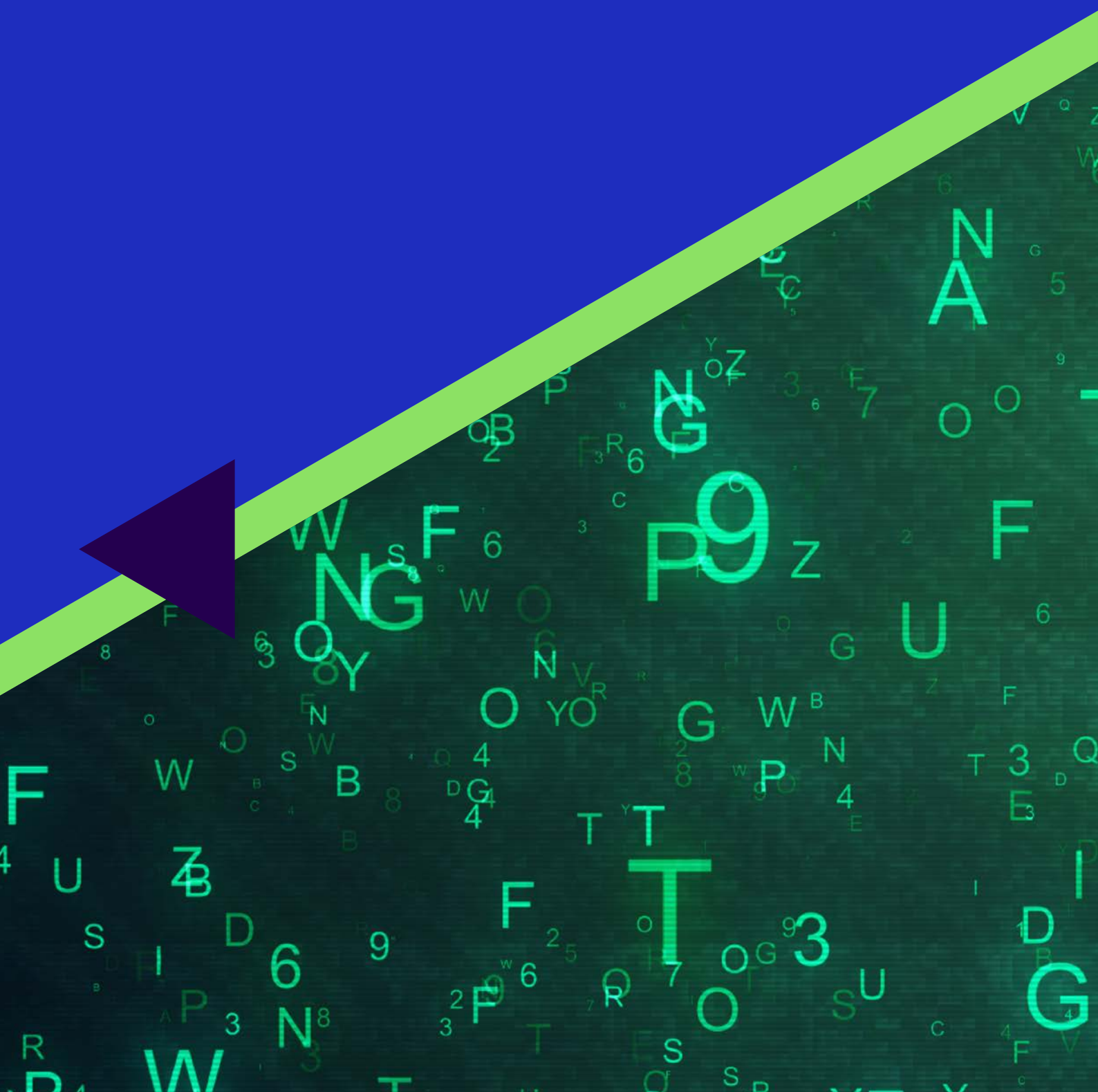
8 One might wonder why these purpose codes have the highest budget for employment and skills promotion ODA. First, formal sector financial intermediaries are often used to channel funds for financial cooperation. Higher education ODA also includes the cost of scholarships, whereby donors support foreign students studying in the donor country.

for green issues. Starting at much lower green levels, financial-sector intermediaries ODA has become greener over time. No clear trend emerges for the other sectors, like business environment and SME development and education-sector ODA (Figure 15). In the appendix, we calculate green shares based on the number of activities by sub-sector (Figure A17). Green activity shares for relevant ODA are generally similar, except for the oil and gas sector where they are lower. Moreover, the proportions of activities where green issues are a primary goal is lower across all sub-sectors.

A dynamic analysis at the sub-sector level allows us to gauge which sub-sectors 'greened' the most in recent years. Figure A18 shows the 20 sub-sectors (CRS purpose codes) with the largest growth in their green share of employment and skills promotion ODA. For example, the top-5 from this list include "Cement" (32166), "Forest industries" (32162), "Textiles, leather, and substitutes" (32163), "Agro-industries" (32161), and "Fishery education/training" (31381). We investigate further to what extent these increases can be attributed to specific donors. To that end, we plot the green shares in these five sub-sectors in 2022 separately for the G7 group of donors (Figure A19). We find that it is mostly the industrial sectors (321) which donors like Germany, France, and Italy have shifted to almost entirely green ODA. The US, on the other hand, within these sectors has contributed no ODA towards its green objectives.



# 5 Text-as-data approach: key results



# 5. Text-as-data approach: key results

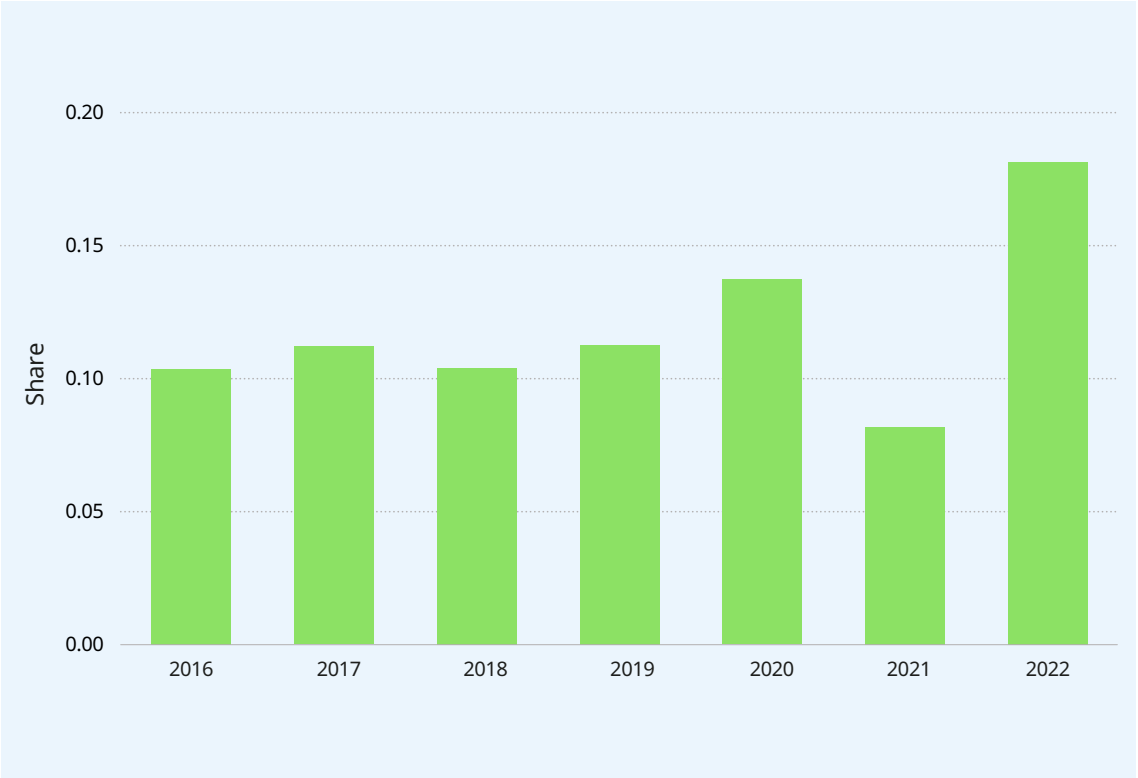
This section presents the results of the LLM approach described in the previous sections. It complements the purpose codes and green markers approach; while the former shows only those projects which have a-priori been indicated as green activities, the LLM approach leverages semantic nuance in the project titles and descriptions to capture those projects which imply green activities but may not been classified as such among CRS projects.

These results are based on a subset of CRS projects, given the computational limitations of embedding the entire CRS data repository. As explained in the LLM implementation overview, we consider for this subsample the years from 2016 to 2022 for the G7 countries and the EC. The results are based on the narrow definition of employment and skills promotion ODA, which excludes employment-relevant infrastructure. The appendix contains results with an extended set including employment-relevant infrastructure.

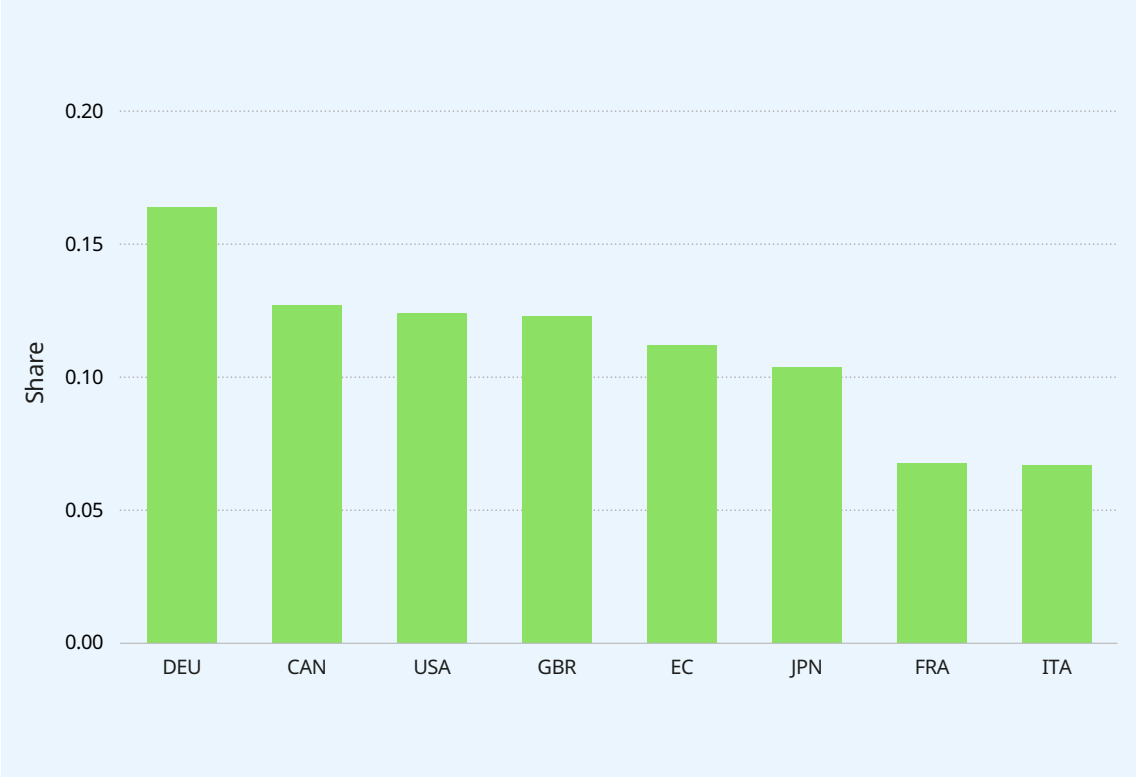
Figure 16 illustrates the annual proportion of green projects within the sample of skills and employment promotion initiatives considered. There is a noticeable upward trend, with the share of these projects exceeding 17% by 2022. This trend aligns closely with patterns observed in sector-specific approaches adopted by the same group of donors. However, due to limitations in the CRS text data, the overall percentage of green projects per year remains lower. For instance, in the sector analysis, the proportion of green projects among G7 and EC peaked at 31% in 2022. These findings indicate that while there is an increasing trend overall, significant variability exists in how green projects are categorized at the level of individual donors rather than at an aggregate level.

Figure 17 instead shows the total share of commitments in green projects per G7 donor, as well as for the EC. In line with the sector approach, Germany and Canada have a relative share of green projects,

**Figure 16. Green share of employment and skills promotion ODA based on commitment amounts for the G7 group of donors**



▶ **Figure 17. Green ODA share of G7 group of donors based on commitment amounts**



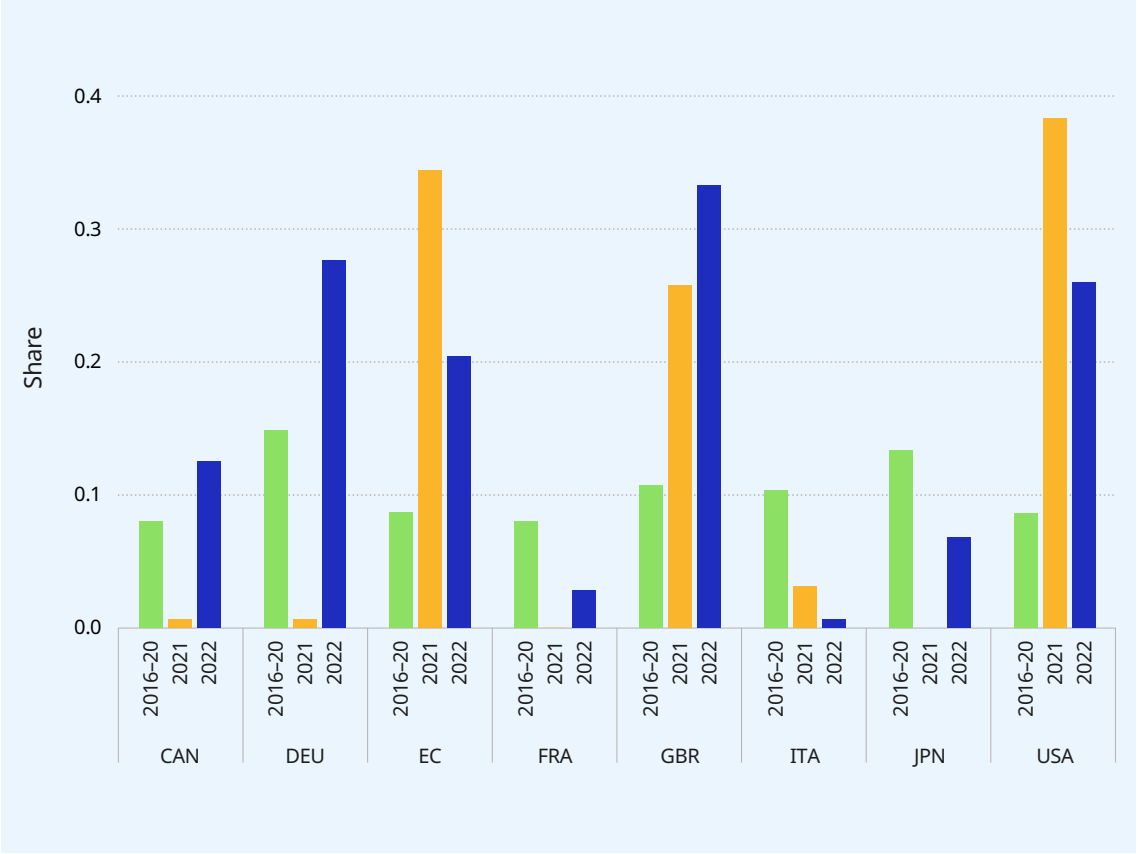

with between 10% and 15% of their total commitments in jobs and skills promotion being green. Contrary to the sector approach, Figure 17 shows that the US has a share of green projects which is similar to that of Canada and the UK. France, Italy, and Japan have lower shares, while the remaining donors have a share which hovers just above 10%.

Finally, Figure 18 provides a full decomposition by donor and year of the share of green employment and skills promotion ODA commitments. This figure shows there is significant variation within donor portfolios over the years in the amount of ODA commitments defined as green. The overall trend is positive, with total green ODA commitments being significantly higher on average in 2021 and 2022 with respect to 2016-2020. The figure also shows significant variation within donors over time. For example, according to the LLM estimations, the share of green ODA commitments dropped for most donors in 2021. However, this can be the result of spurious changes in the quality of the underlying text data and is not supported by a downward trend. Canada only had a small increase in green ODA commitments over time, while Italy's commitments dropped. However, it should be noted that Canada, together with Italy, provide the lowest ODA amounts within the G7 as shown in Figures A6 and A7. Overall, the plot shows that there was a structural jump towards more green employment and skills promotion activities post 2019.

These figures contain the baseline results, based on total volume of employment and skills promotion commitments which have been tagged as green. Appendix figures A22-A24 show the respective results when considering disbursement amounts.[9] Overall, the results are comparable. Over time, the share of green disbursements is slightly lower than the commitment amount, which is reflective of the fact that not all has been disbursed. Disbursements depend on many factors beyond the project's original intent. As they are however a good measure of impact, we report these results and conclude that there is little difference across donors in this regard.

9 All disbursement results are computed based on the baseline LLM model, matching CRS descriptions long descriptions with the full set of projects in the golden dataset.

▶ **Figure 18. Share of green employment and skills promotion by the G7 group of donors and year**

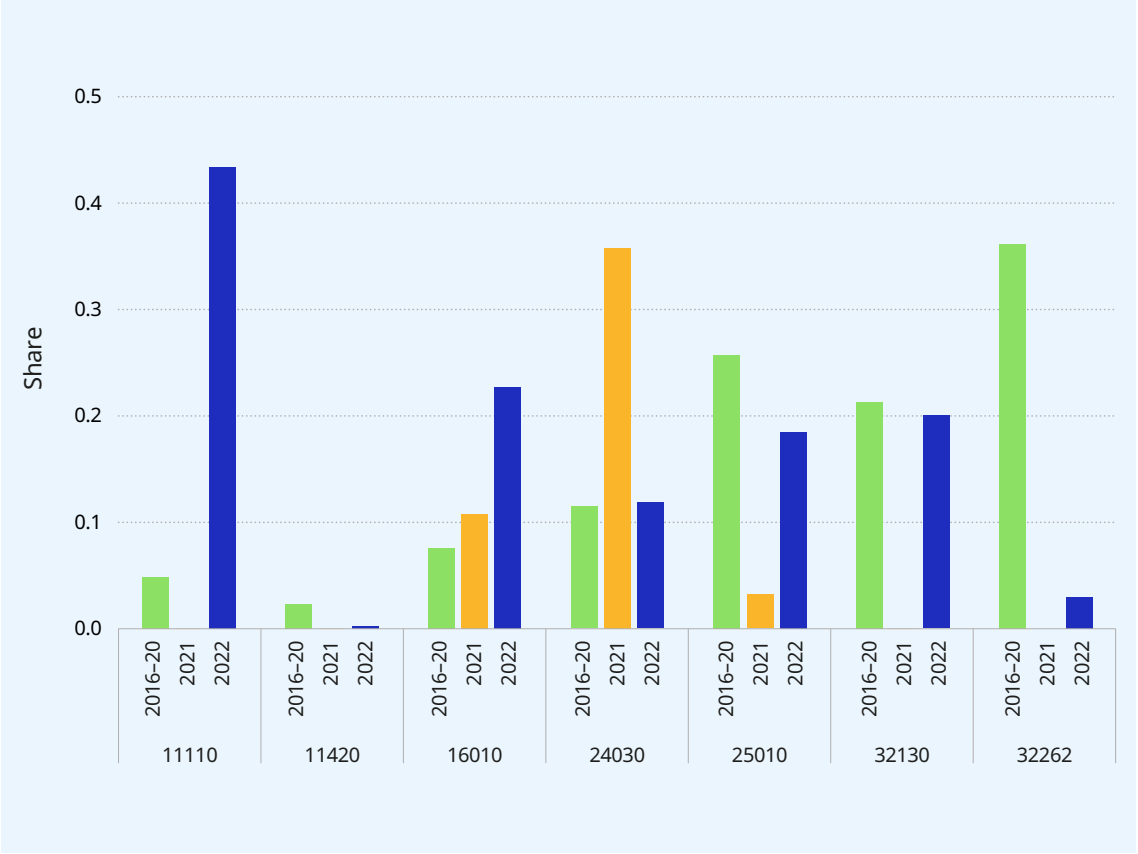



The baseline results shown here are based on a definition of employment and skills promotion ODA which does not include employment-relevant infrastructure. Figures A25 and A26 in the appendix consider an extended sample which adds this employment relevant infrastructure. Aggregate results are broadly in line with the main figures which exclude employment-relevant infrastructure, with the green share increasing over time. Canada and the U.S. show large single year peaks in the share of green ODA when including employment-relevant infrastructure. Aside from these outliers, the overall level is smaller. These specific donor and year trends in the share of green ODA commitments, which occur when including employment-relevant infrastructure, suggest that green activities as measured with an LLM approach are concentrated in certain sectors. The next section provides a sub-sector analysis to shed more light on this issue.

## LLM approach: sub-sector analysis

As with Figure 15, we can apply the LLM approach to the sub-sector level to analyze different sub-sectors, or CRS *purpose codes*, and their contribution to the G7 green target. As outlined previously, we consider the seven most relevant sub-sectors for employment and skills promotion in 2022 and compute their share of green ODA, according to an LLM approach. Figure 19 plots these results. The share of green ODA commitments for these sub-sectors differs from what is found in the sector approach. For example, 'Oil and gas' projects (32262) are identified as being less green overall and with a downward trend, in contrast to Figure 15. This shows a tension between what the reporting entity self-classifies as 'green', versus what the project descriptions describe as green. In general, however, there is no clear trend among these top employment and skills promotion sectors, indicating the need to consider which sectors are changing systematically according to our LLM approach.

▶ **Figure 19. LLM approach, contributions of specific sub-sectors to the G7 green target**




To further analyze which sub-sectors are 'greening' most quickly, we follow Figure A18 in the appendix. Figure A27 in the appendix shows the 20 sub-sectors, among the G7 countries and the EC, which between 2016 and 2022 have undergone the biggest positive change in their share of green employment and skills promotion. The difference between the top sectors in this distribution and the remaining ones shows the concentration of green activities among certain sectors. With the LLM approach, we find that industry and mineral resources and mining related activities (32174, 32267, 32264, and 32163) have experienced the largest increase in green ODA. In these five sub-sectors, the share of green ODA has increased by at least 60 percentage points from 2016. In the case of purpose code 32174 ('Clean cooking appliances manufacturing'), the nearly 100 percentage points increase indicates that in 2016 the share of green ODA commitments in this sub-sector was almost 0%.

Finally, Figure A28 shows the donor-specific contributions to the green target by these top five fastest growing sectors discussed above. The figure shows that in general countries have concentrated their contributions to the green objectives within specific sectors. For example, Canada has seen a strong growth in green ODA in the nonferrous metals sector (32264) where green ODA shares are now 97%, while for Germany the biggest change towards green ODA has been in the textiles, leather and substitutes sector (32163), where the green share is 75%. The jump in the green ODA share within purpose code 32174 ('Clean cooking appliances manufacturing') is driven by France and the U.S., both which went from 0 to almost 100% green ODA in this sub-sector between 2016 and 2022. The green share of environmental education/training ODA commitments have instead grown consistently across donors, with France and Great Britain increasing the most (now at 89% and 80% respectively).

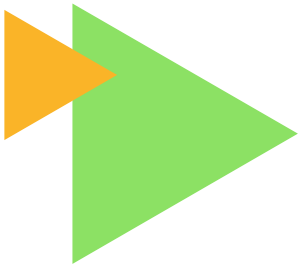
## LLM approach: additional tests and future steps

To test the sensitivity of the model with different inputs, it is important to update the "golden dataset" of projects to match against. For future reports, it is recommended to conduct a systematic analysis that varies this set of projects. Table 6 compares different types of information suitable as inputs for a text-as-data approach to track greening skills or employment promotion trends in ODA projects. Enriching this dataset with project descriptions that include terminology, keywords, or concepts related to future green employment and skills, especially those discussed in the context of the Just Transition or G7 objectives, would enhance the model's ability to provide insights on future trends and ensure more stability in future iterations.

Figures A29 to A31 in the appendix demonstrate how results can vary based on the matching (golden) dataset. These figures decompose our full golden dataset of multilateral green projects into their subsets. There is large variability across donors and matching subsamples. The key takeaway is that the project descriptions of donors, which through the LLM drive the donors' green ODA share, match better with certain green projects in the golden dataset. For example, when using a sample of only World Bank projects to match against, the share of Japanese and U.S. ODA classified as green in 2022 jumps to around 80%. The interpretation is that the way Japanese and U.S. projects are described semantically matches strongly with World Bank (and ILO) green projects, hence driving the results seen. Similarly, the descriptions of German projects tagged as green are most similar to ILO green projects.

▶ **Table 6. Examples of domain-specific knowledge as inputs within text-as-data approaches**

| Type | Source | Model sample input text | Advantage |
|---|---|---|---|
| Keywords | OECD | renewable, recyclable, clean, bio, eco, environmental, earth, sustainable, etc. | Standardized/ common |
| ODA project sources | ILO JOR/19/03/DEU | "Increased capacity of Member States to formulate and implement policies for a just transition towards environmentally sustainable economies and societies" | Captures semantic nuance in existing (tagged) "greening" projects |
| Future 'green' concepts | G7 partners/ stakeholders | Specific terminology, keywords, or concepts related to *future* green jobs and skills objectives | Future proofing of adopted methodology |



# 6 Discussion and conclusion

# 6. Discussion and conclusion

This report presented new estimates of Official Development Assistance targeted toward 'green' employment and skills promotion, involving the development of jobs and skills in green sectors and the greening of traditional sectors related to employment and skills promotion. Estimates were obtained from an approach combining activities with purpose codes related to employment and skills promotion and 'green' markers indicating aid activities with relevance for biodiversity, climate adaptation, climate mitigation, desertification, and the environment. Both pieces of data are available in the Creditor Reporting System. In addition, the report explored the potential for using Large Language Models to identify 'green' employment and skills promotion from activity-level project descriptions. Such an approach could complement the analysis based on purpose codes and green markers.

At its June 2022 summit, the G7 committed to increasing the share of 'green' employment and skills promotion ODA by 2025. The approaches to measuring 'green' employment and skills promotion developed in this report help evaluate to what extent the G7 group—which includes the G7 countries and the European Commission—is on track with respect to this commitment. The results from the approach based on purpose codes and green markers showed that the G7 group has already increased its ODA share toward green employment and skills promotion programmes in the years prior to its June 2022 commitment. This increase was driven in particular by the EC, Germany, and Japan. However, the overall increase was largely due to activities in which green issues had significant relevance—rather than being their primary objective. Encouragingly, the increase in the share of green ODA within employment and skills promotion programmes was due to an absolute increase in the commitment amount of relevant green activities—rather than due to a decline in overall employment and skills promotion aid. In fact, the G7 group expanded its support for employment and skills promotion ODA in the past decade, although green ODA in general increased more robustly. The results from the LLM approach yielded generally lower shares of green ODA within employment and skills promotion programmes across all G7 donors. Yet, they confirmed the existence of an upward trend in the green share of employment and skills promotion ODA for G7 donors in recent years.

The report also discussed key methodological choices involved in different approaches to measuring 'green' employment and skills promotion aid. For example, the results differed when using a broader definition of employment-related ODA that also includes employment-relevant infrastructure. Similarly, the results of the LLM-based approach would differ for different training data.

Our recommendations for the G7 group on conducting their future reporting on 'green' employment and skills promotion ODA are threefold. First, there is value in using the two approaches developed in this report in a complementary manner, given their respective merits and demerits. For example, the combination of relevant CRS purpose code and green markers is static and does not reflect evolving understandings of related concepts. Moreover, it relies strongly on how reliably donors screen the data for green projects. The LLM-based approach is more adaptive but may at the same time lack explainability. Specifically, its results hinge on the type of inputs from which the algorithm inductively 'learns' relevant concepts. Therefore, the recommendation is to communicate the point estimates for green employment and skills promotion aid as well as the range of these estimates obtained from different approaches.

Second, as further refinement of the approach is desirable, donors need to agree on projects that are classifiable as green employment and skills promotion activities. A greater training set will allow the algorithm to perform better in classifying new activities.

Third, there is scope for extending the analysis to include the multilateral outflows of G7 donors that may be relevant for green employment and skills promotion. The present analysis was based on aid activities under the direct control of G7 donors. In reality, however, donors also provide core contributions to multilateral organizations like the International Labour Organization whose work is relevant for green employment and skills promotion. Future research should develop a methodology to take these flows into account.

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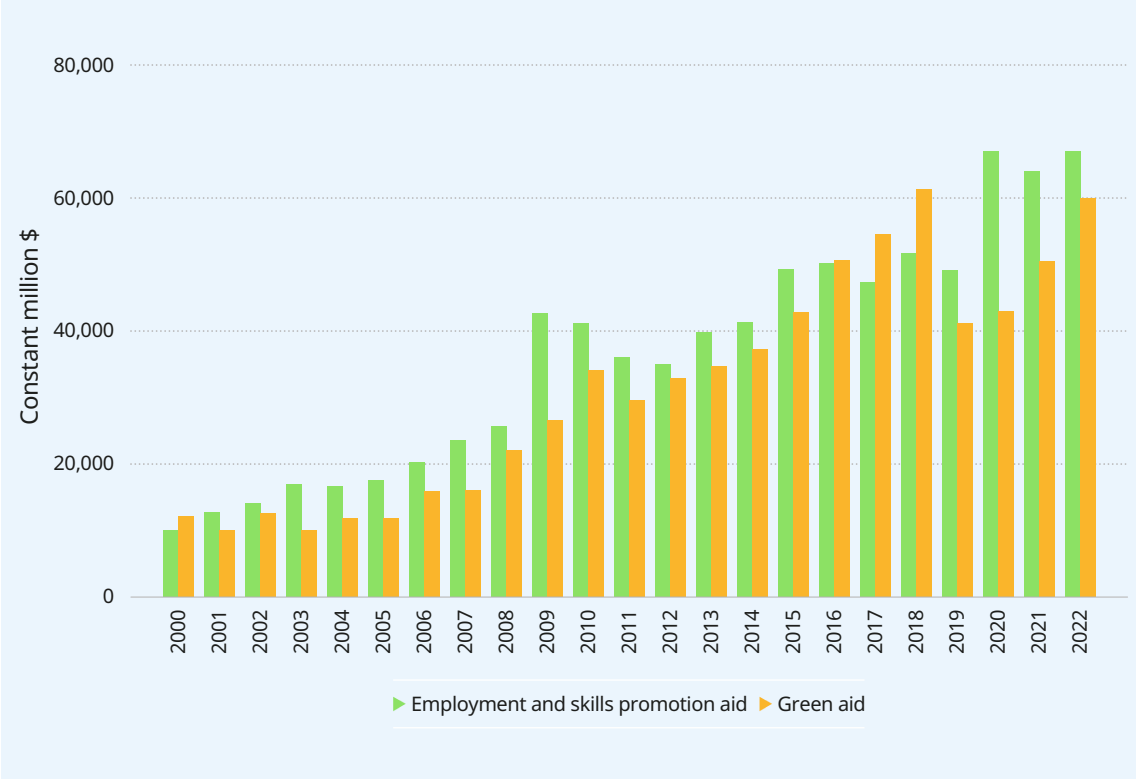
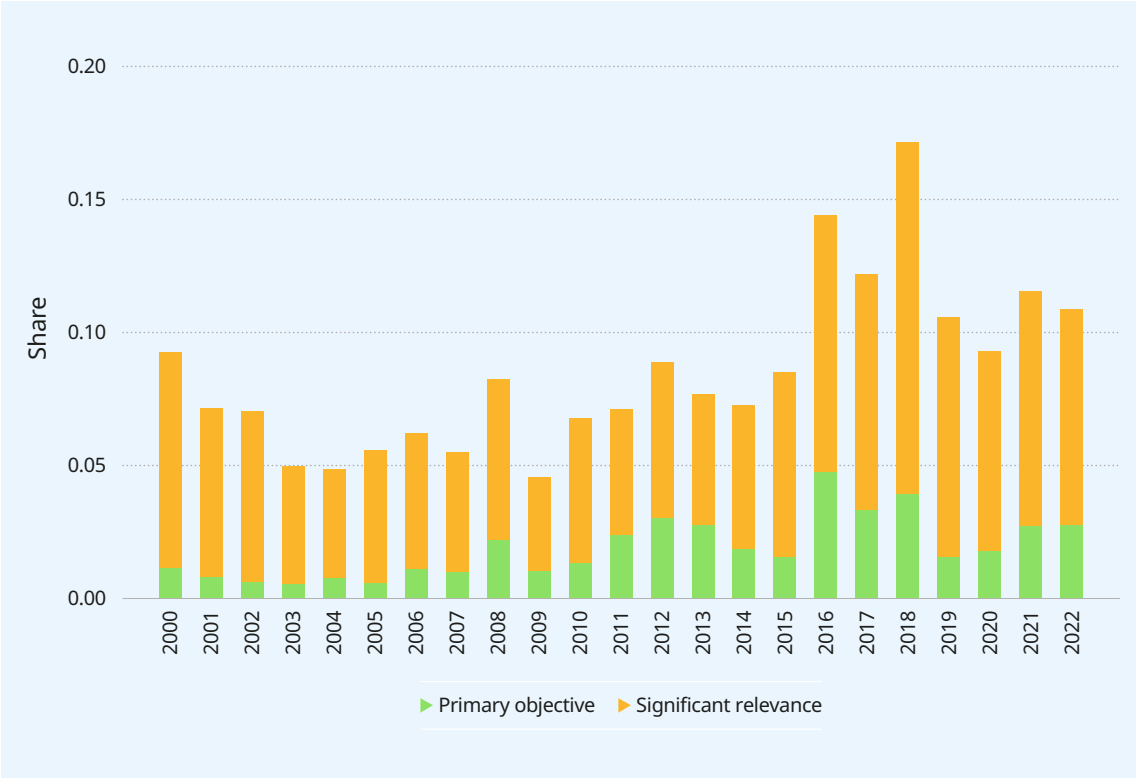
# Appendix

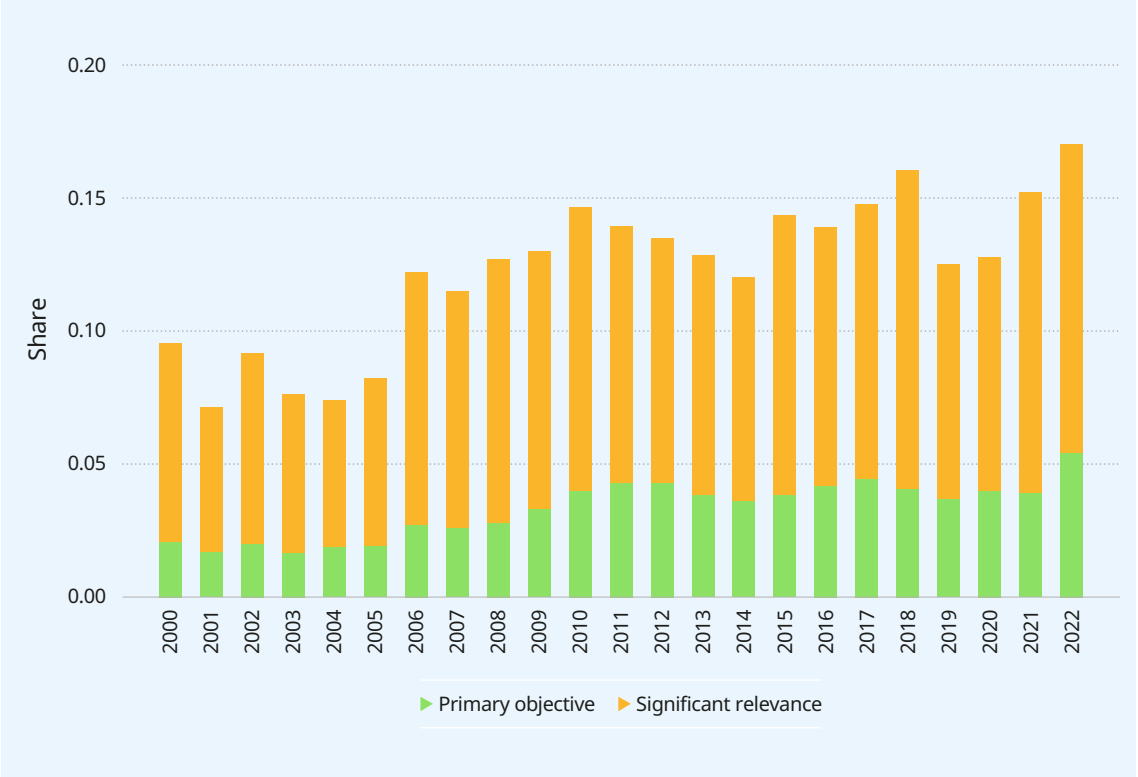
### ▶ Figure A1. Total annual disbursements by all reporting donors




### ▶ Figure A2. Annual share of green jobs and skills promotion ODA based on disbursements

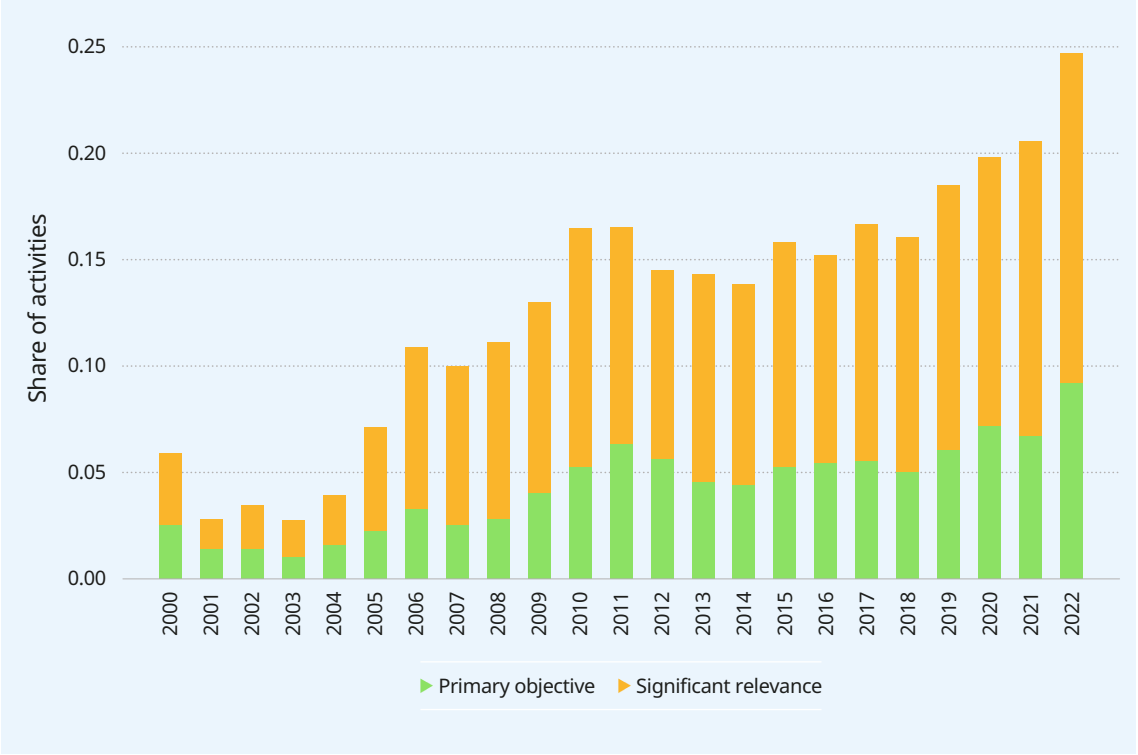


### ▶ Figure A3. Annual share of green jobs and skills promotion activities

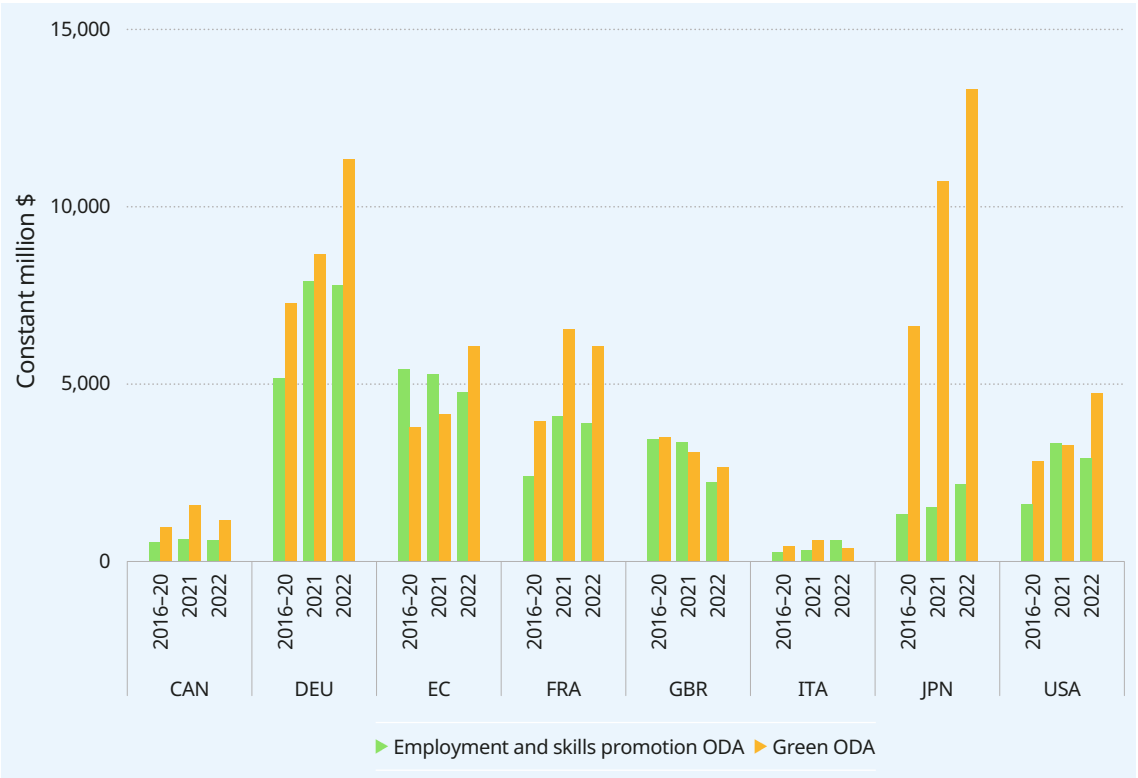



### ▶ Figure A4. Total annual disbursements by G7 donors and European Commission

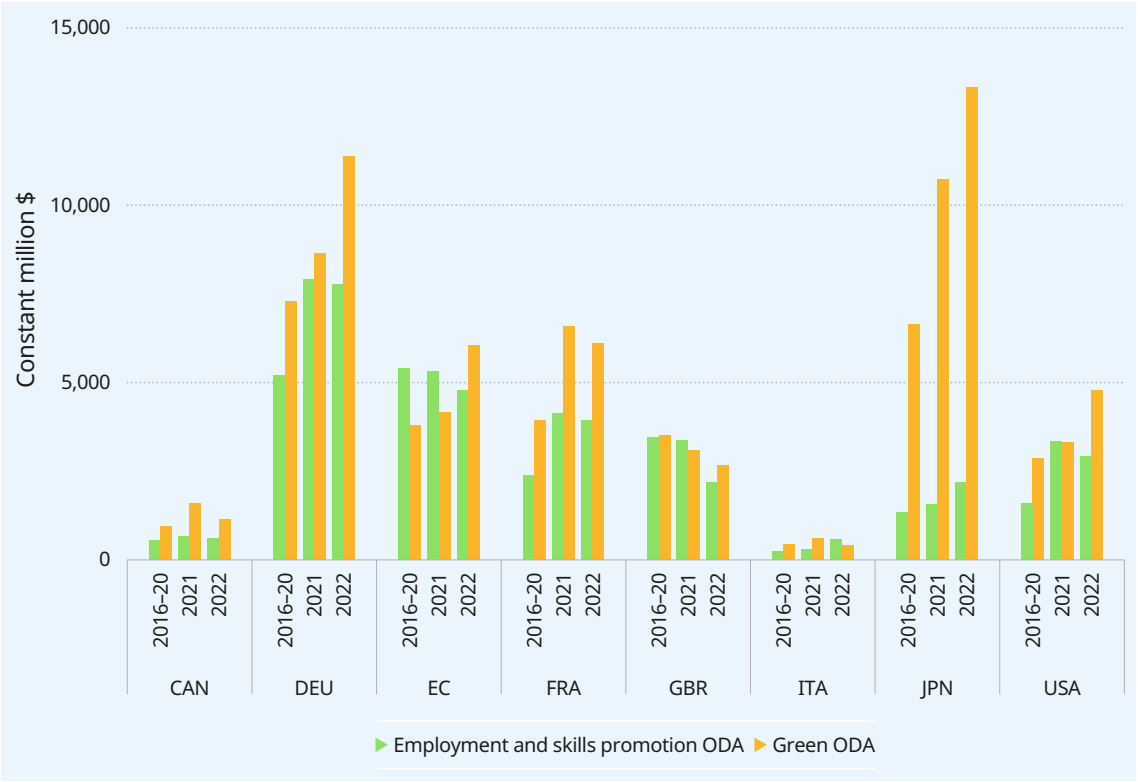
### ▶ Figure A5. Annual share of green jobs and skills promotion activities from G7 donors and European Commission



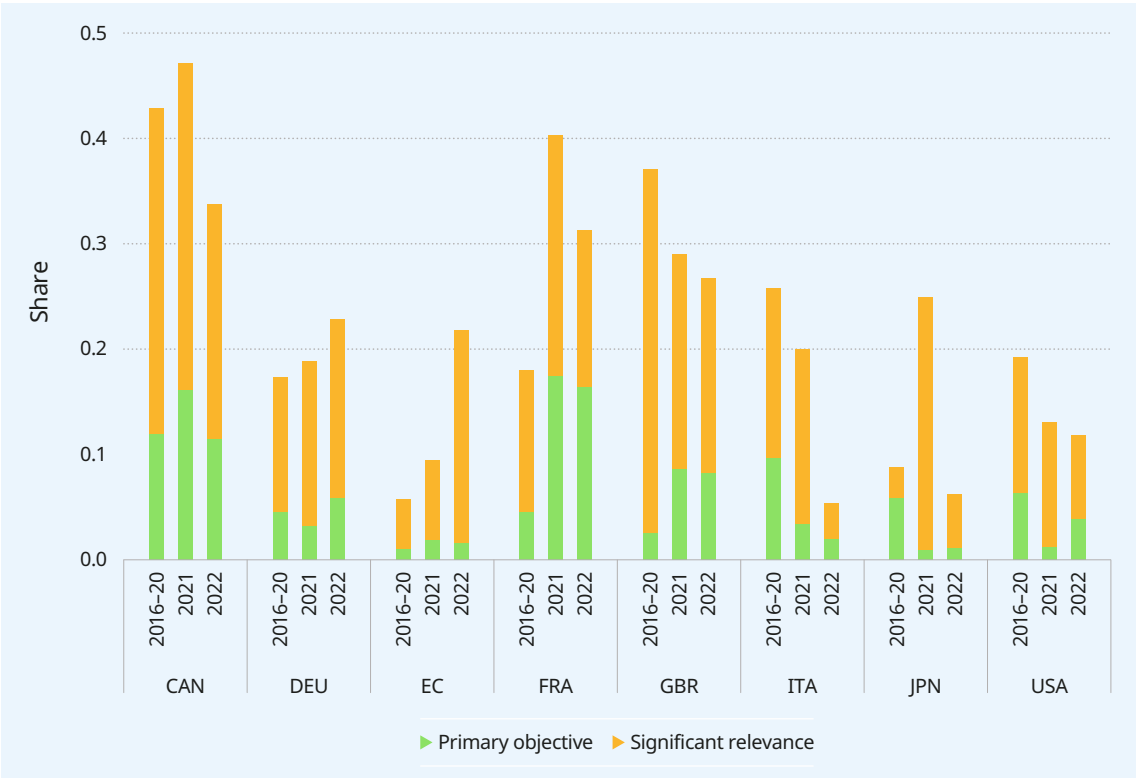

### ▶ Figure A6. ODA disbursements for different purposes by G7/EC donors over time



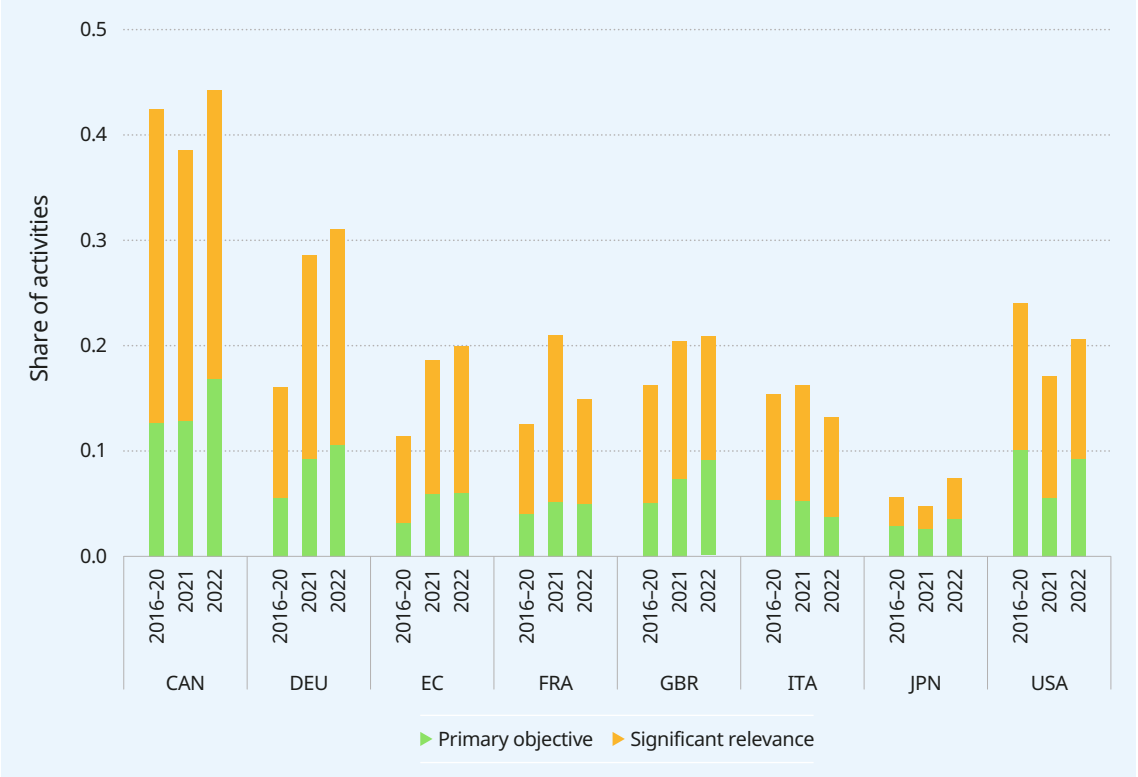
▶ **Figure A7. Green content in employment and skills promotion ODA based on disbursements**



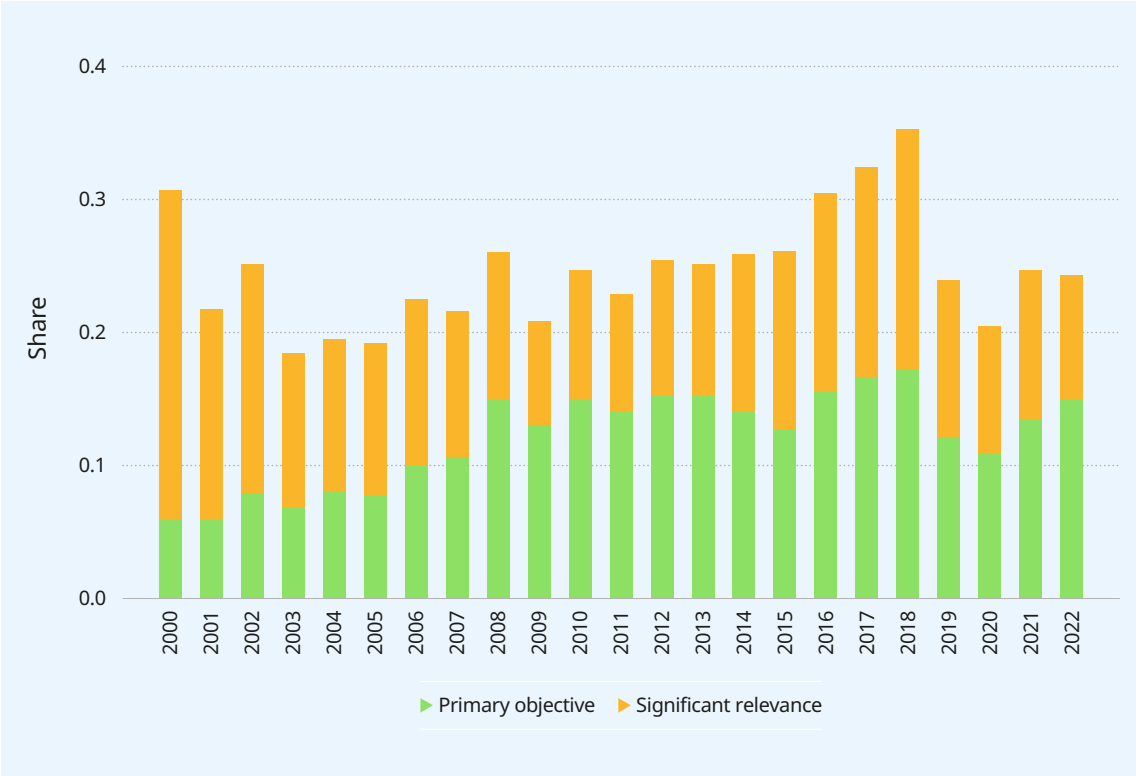

▶ **Figure A8. Share of green employment and skills promotion ODA based on disbursements**



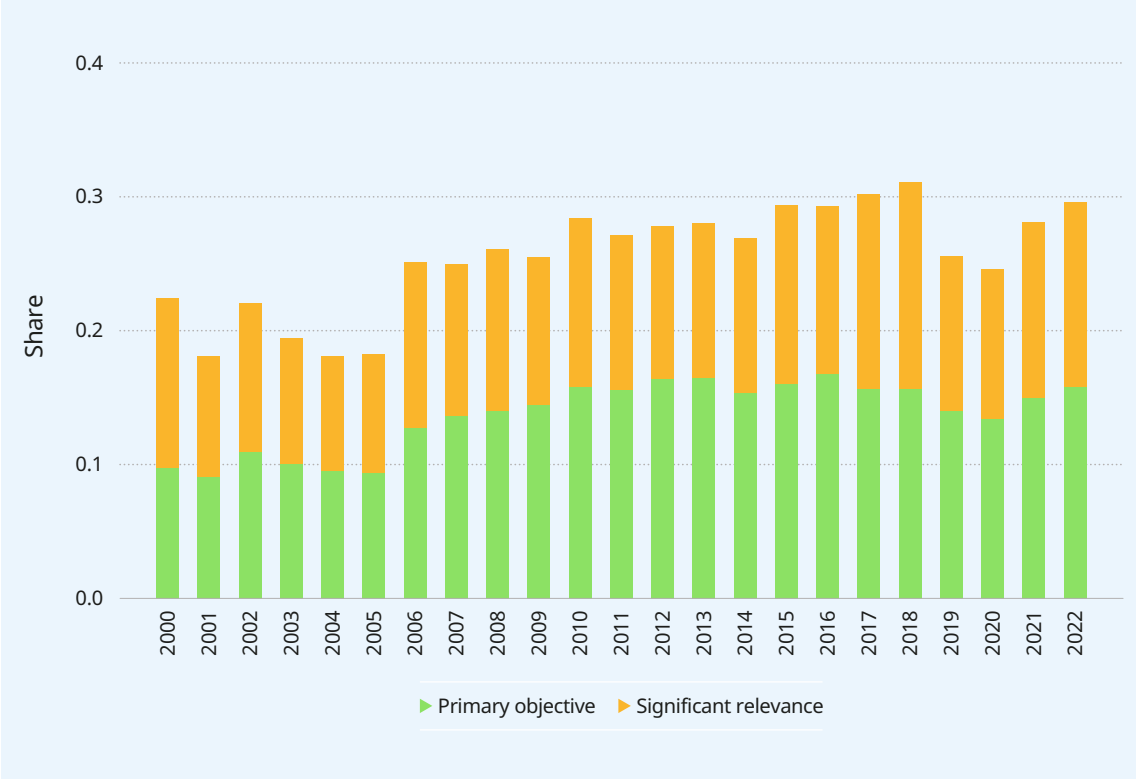
### ▶ Figure A9. Share of green employment and skills promotion activities



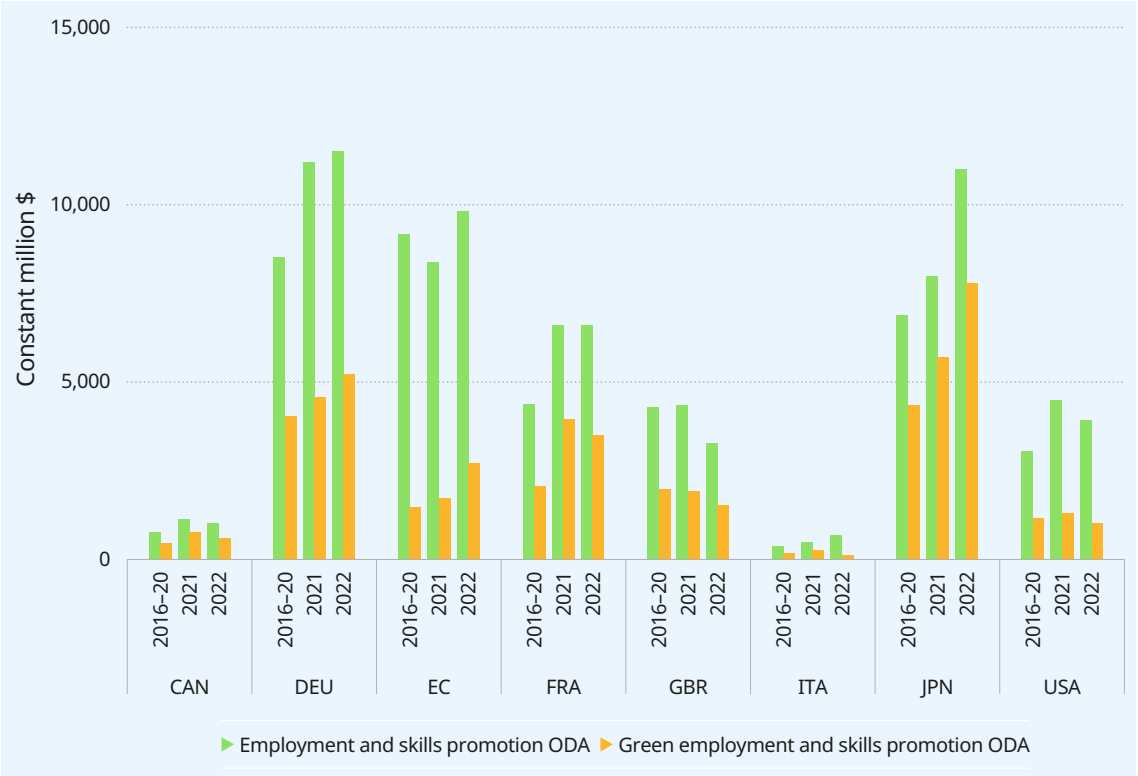

### ▶ Figure A10. Share of green employment and skills promotion ODA for all reporting donors based on disbursements



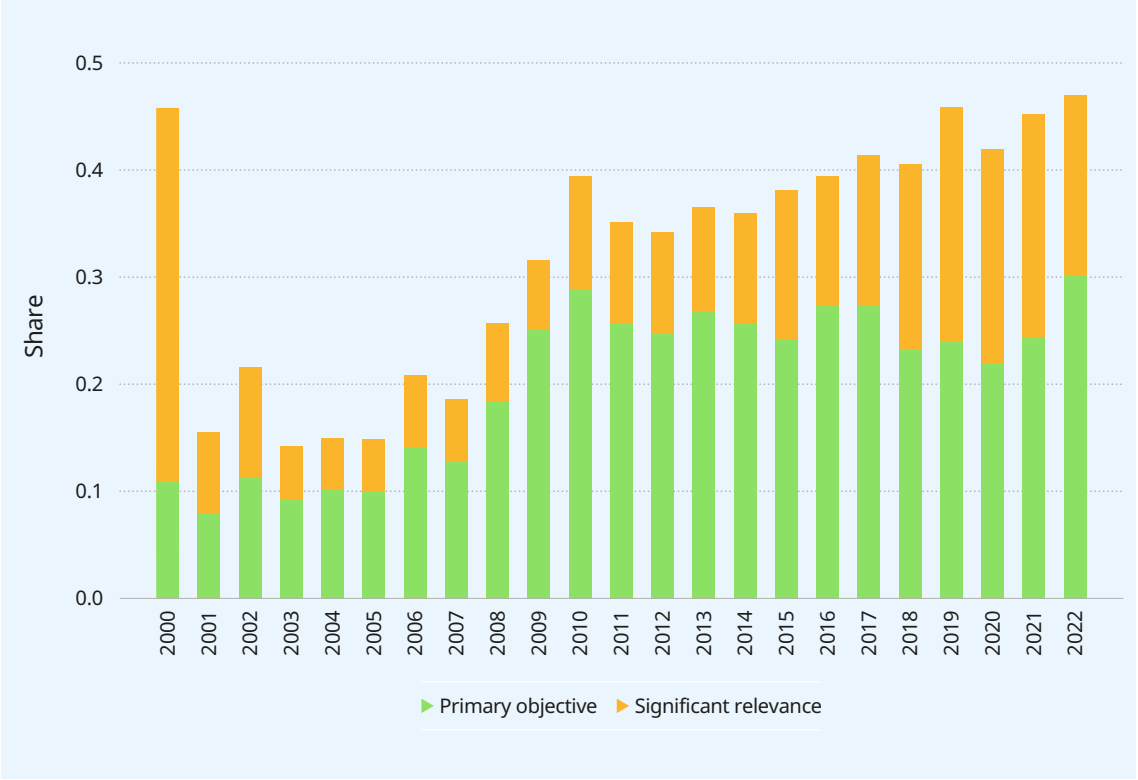
▶ **Figure A11. Share of green employment and skills promotion activities for all reporting donors**



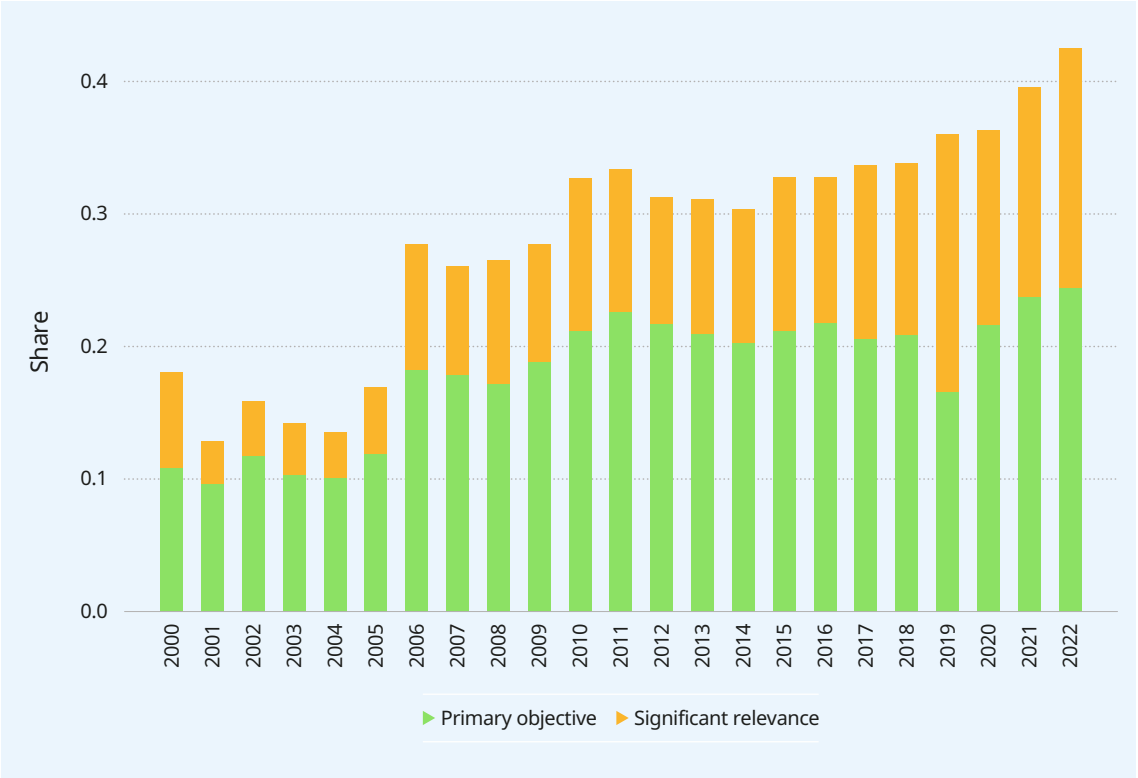

▶ **Figure A12. ODA disbursements including employment-relevant infrastructure aid**



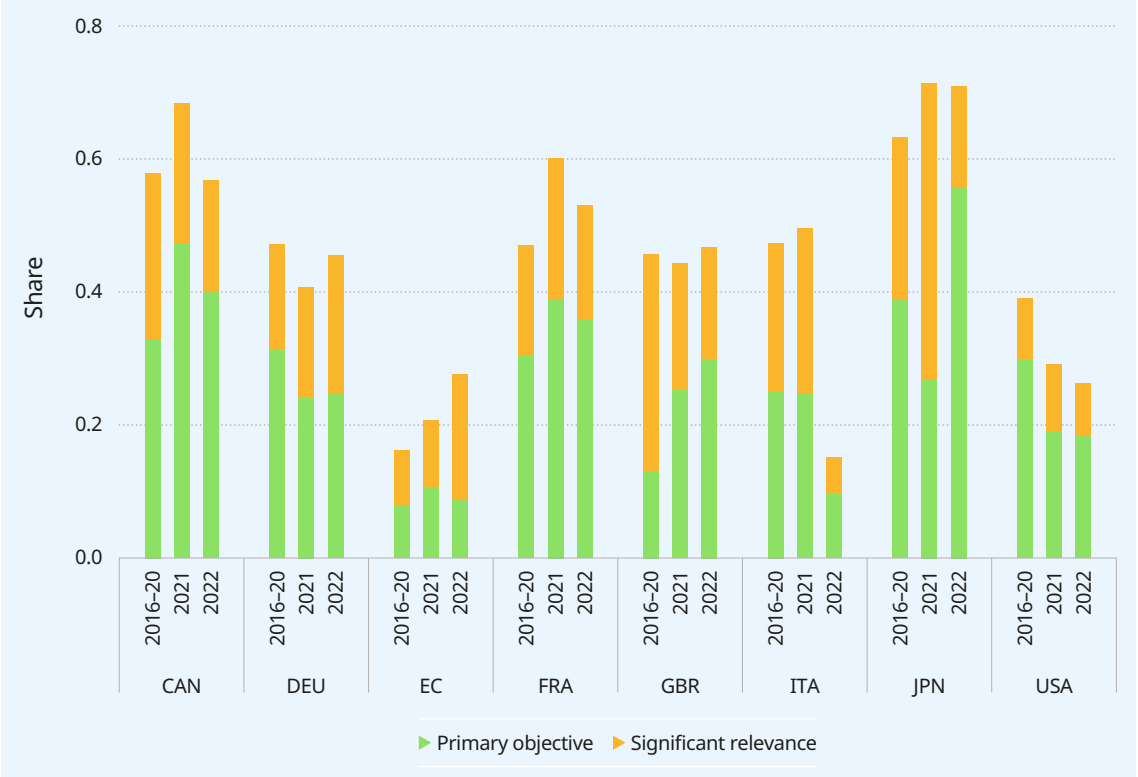
### ▶ Figure A13. Green ODA share of G7/EC donors based on disbursements



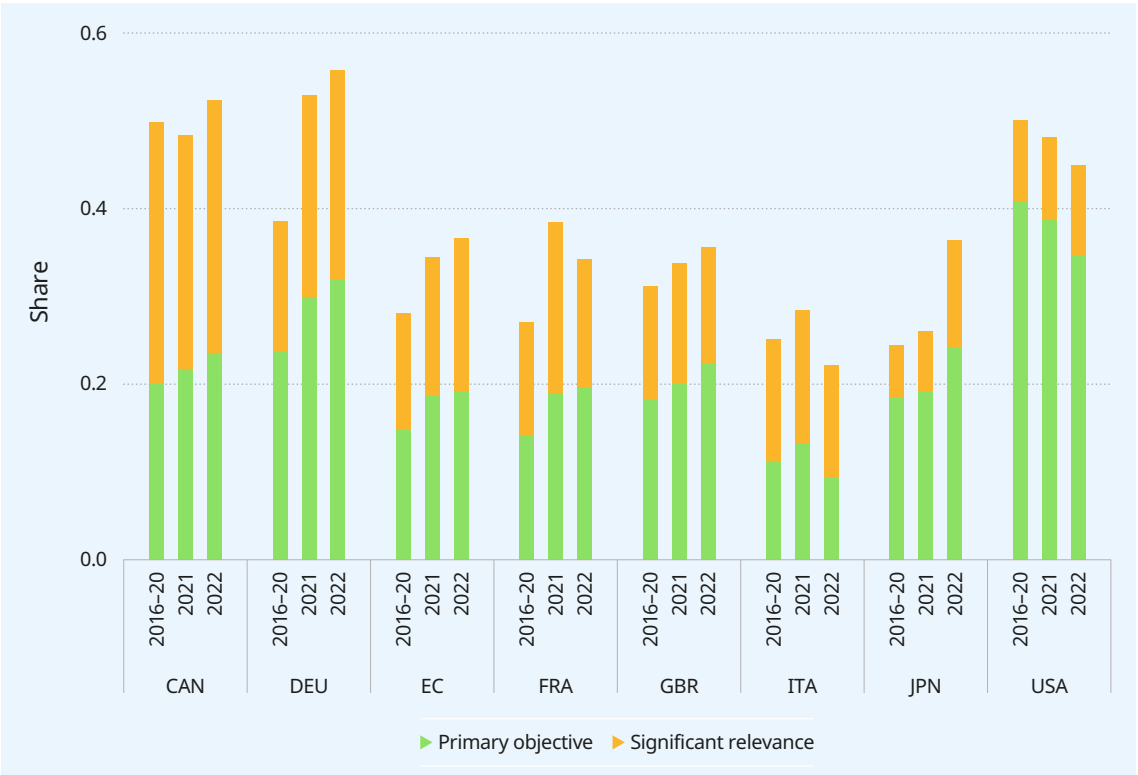

### ▶ Figure A14. Green ODA share of G7/EC donors based on number of activities



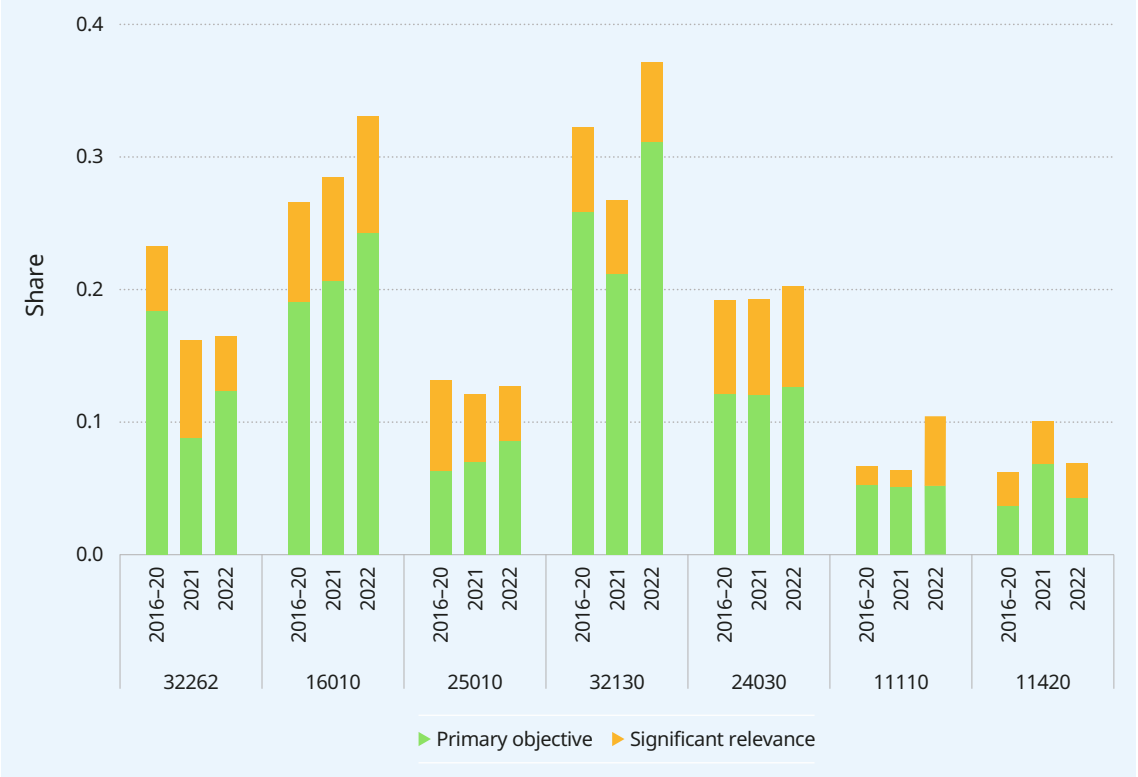
▶ **Figure A15. Green ODA share by G7/EC donor over time based on disbursements**




▶ **Figure A16. Green ODA share by G7/EC donor over time based on the number of activities**

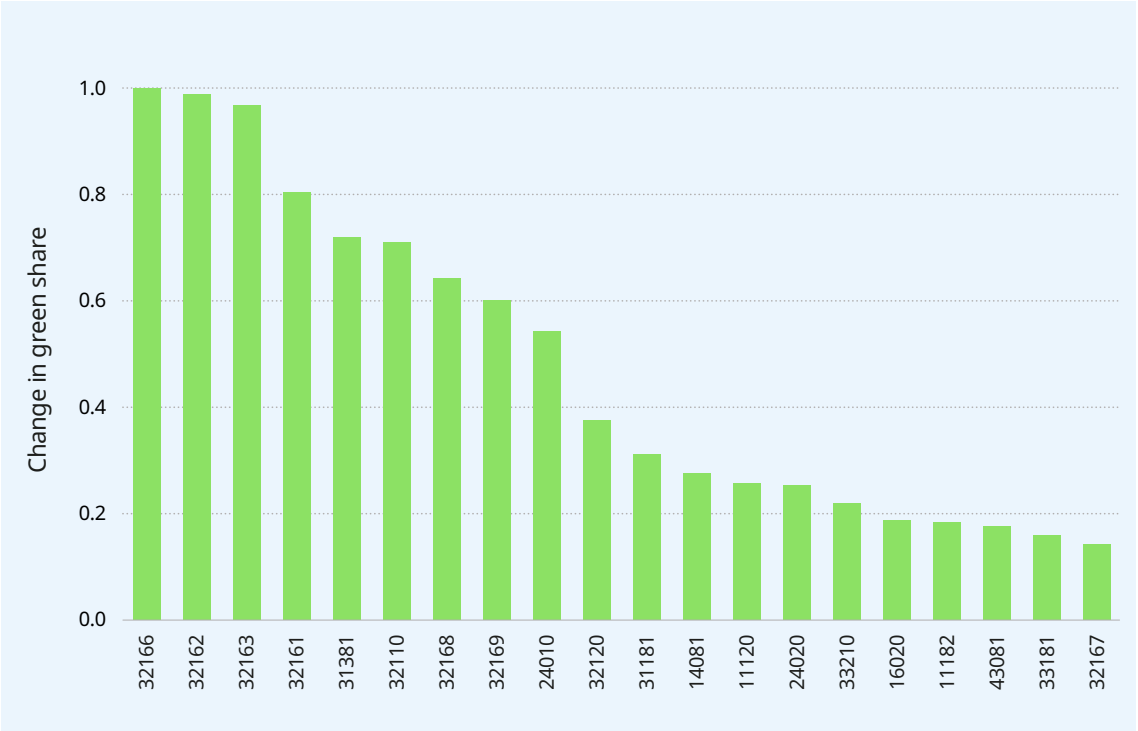


### ▶ Figure A17. Contributions of specific sub-sectors to the G7 green target based on number of activities

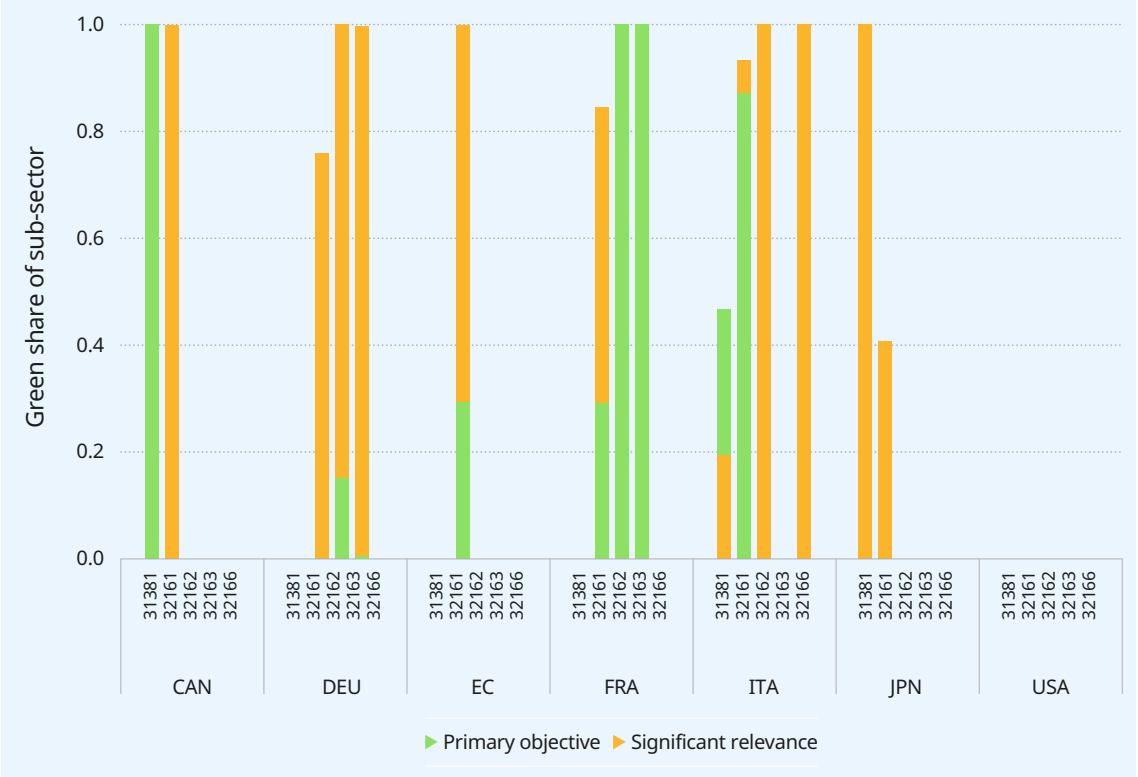



**Note:** The graph shows the 7 sub-sectors that account for the highest share of employment and skills ODA.

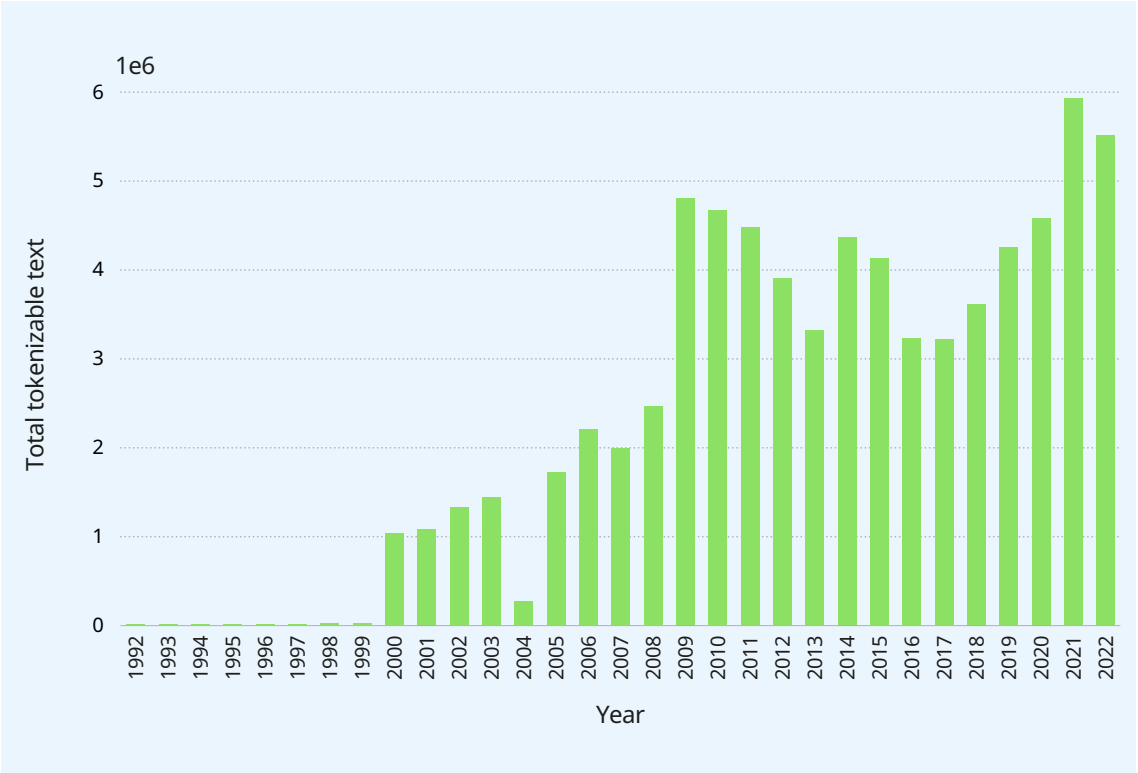
### ▶ Figure A18. Sub-sectors with the largest increases in the green share between 2016-2022



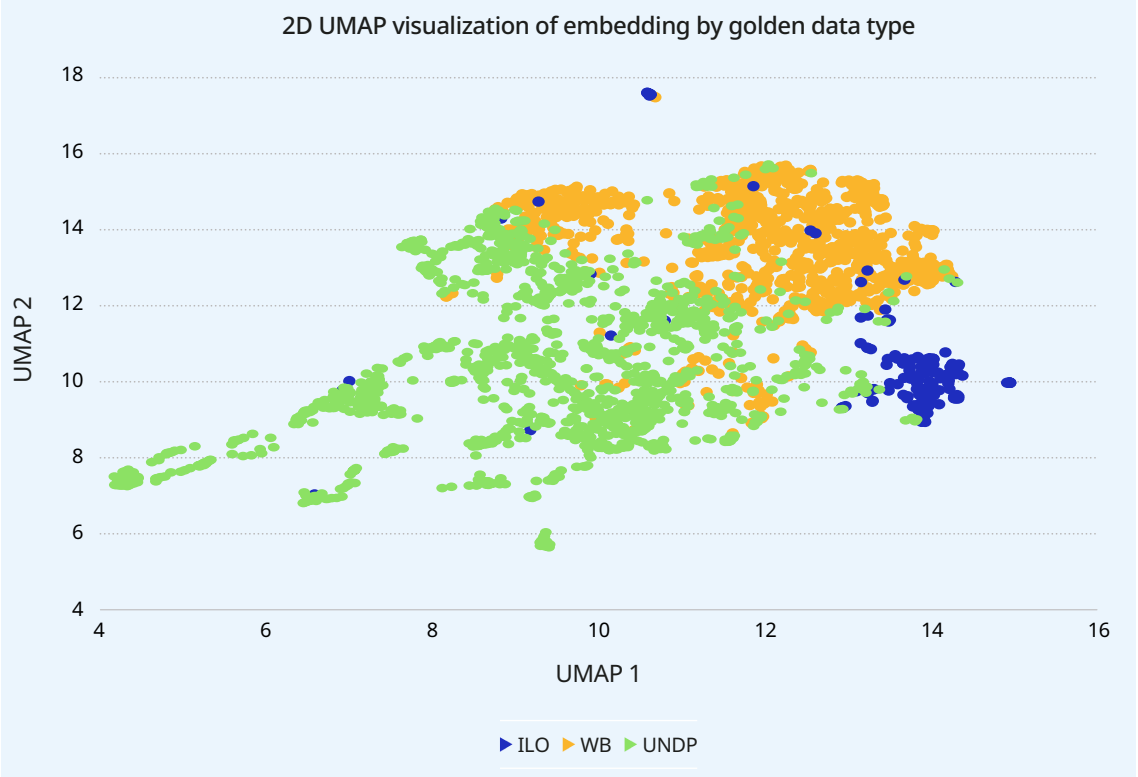
▶ **Figure A19. G7 donors' green share of employment and skills promotion ODA in specific sub-sectors in 2022**



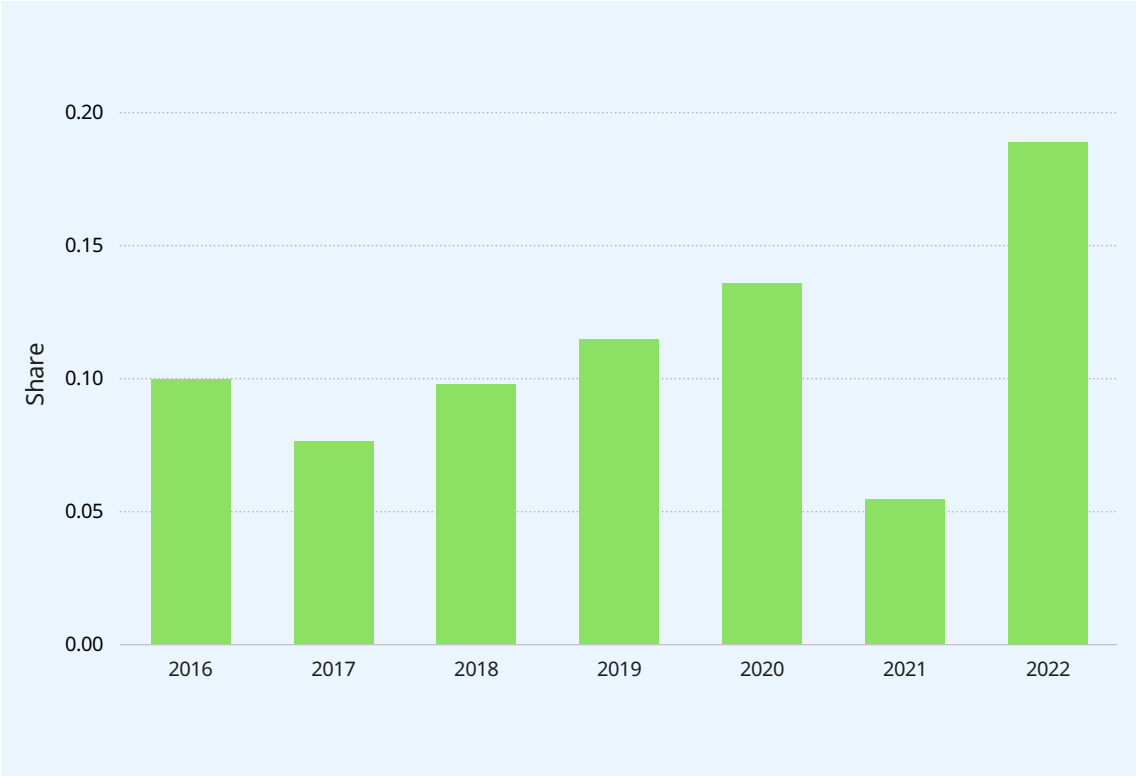

▶ **Figure A20. CRS Data quality over time – total tokenizable text per year among all reporting donors**



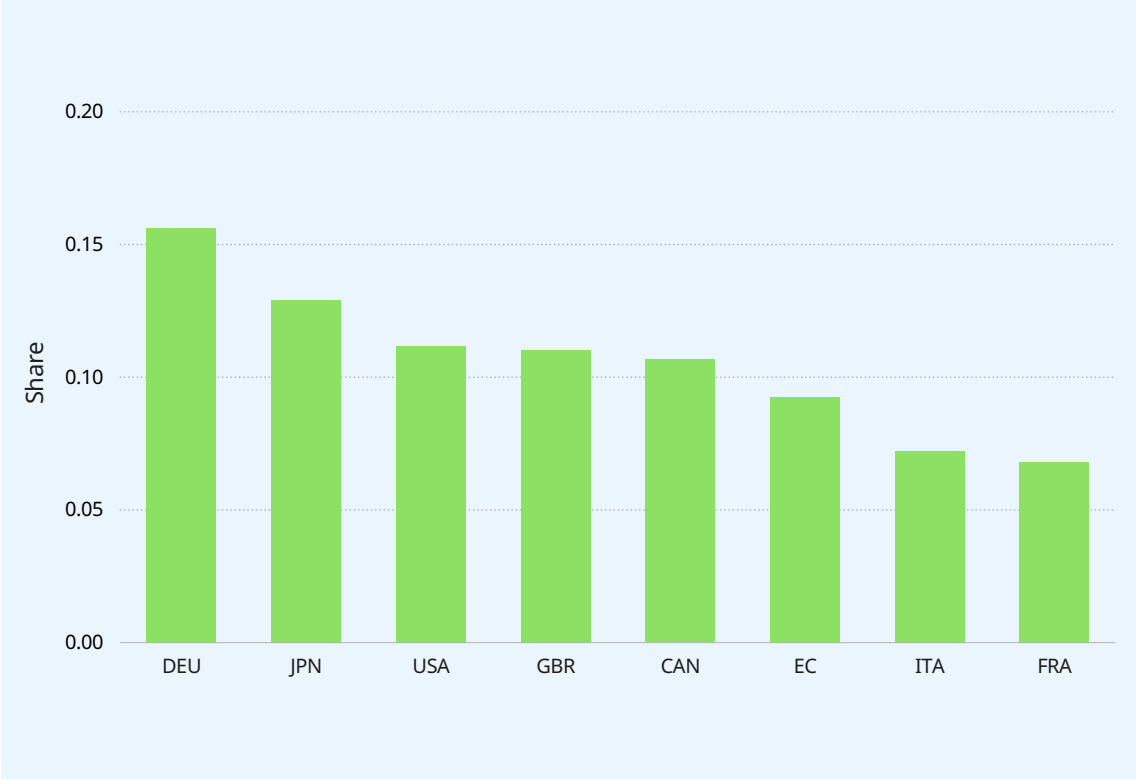
▶ **Figure A21. 2-dimensional representation of golden dataset project embeddings**



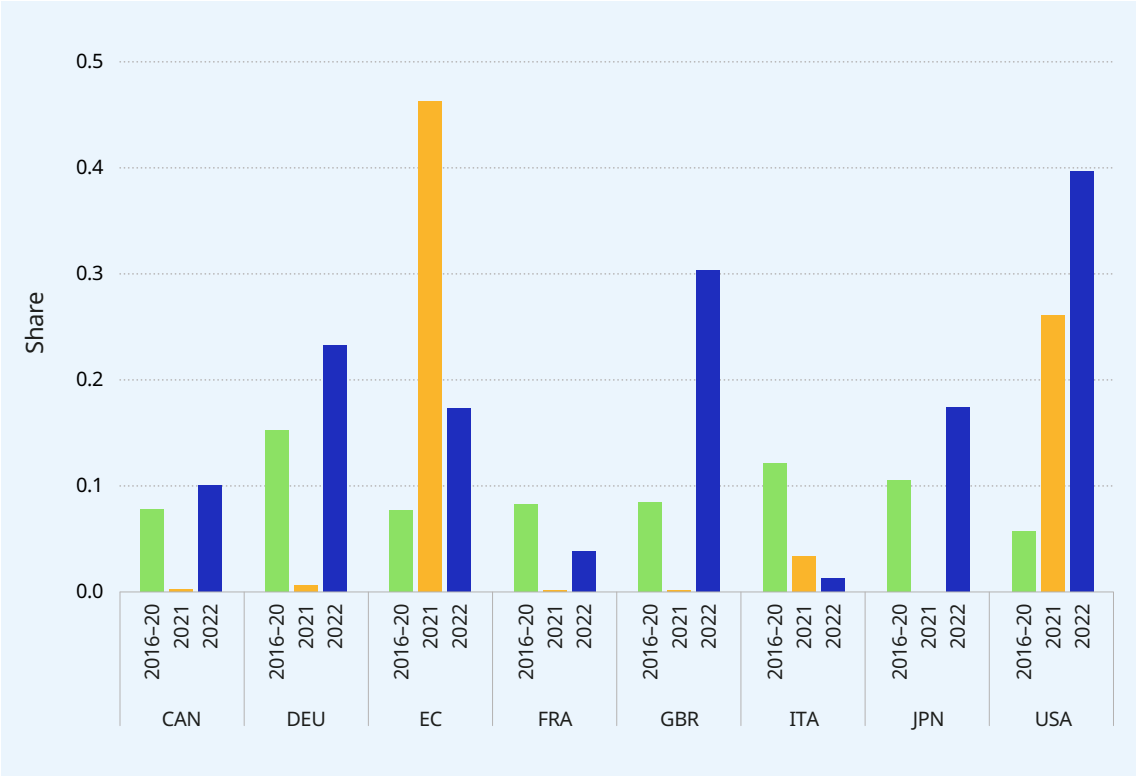

▶ **Figure A22. Yearly green ODA share based on disbursement amounts, G7 + EC**



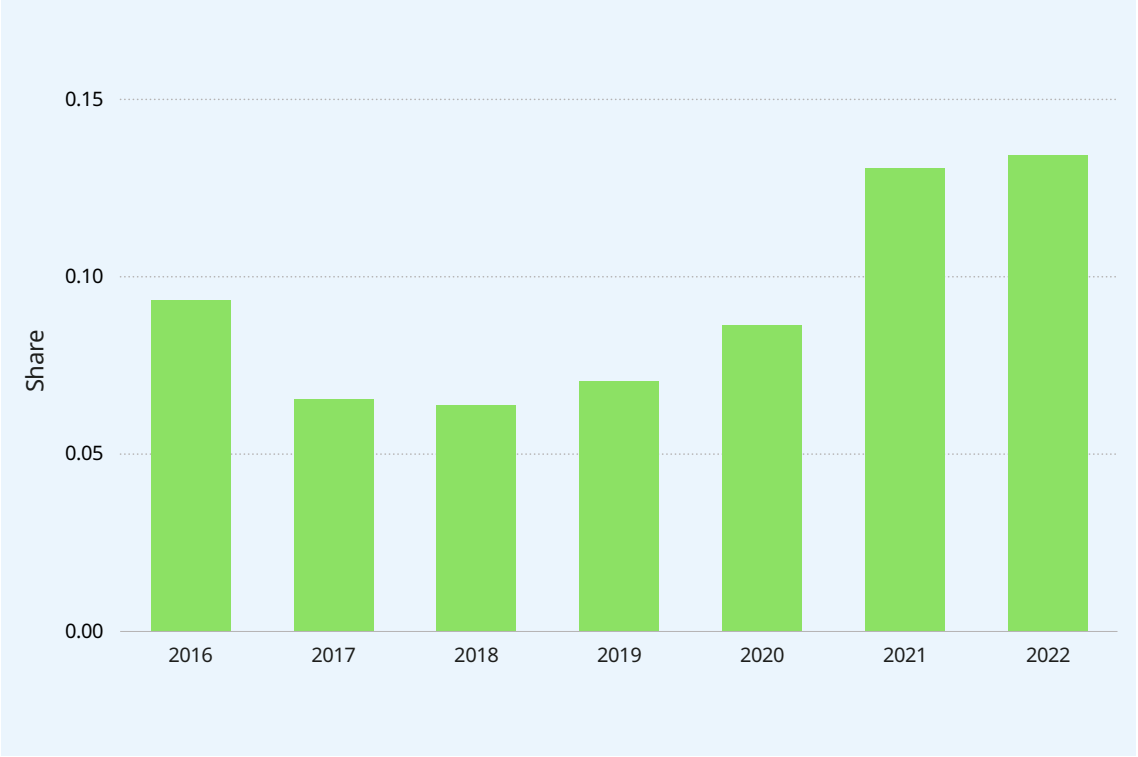
▶ **Figure A23. Green ODA share of G7 + EC donors based on disbursement amounts**



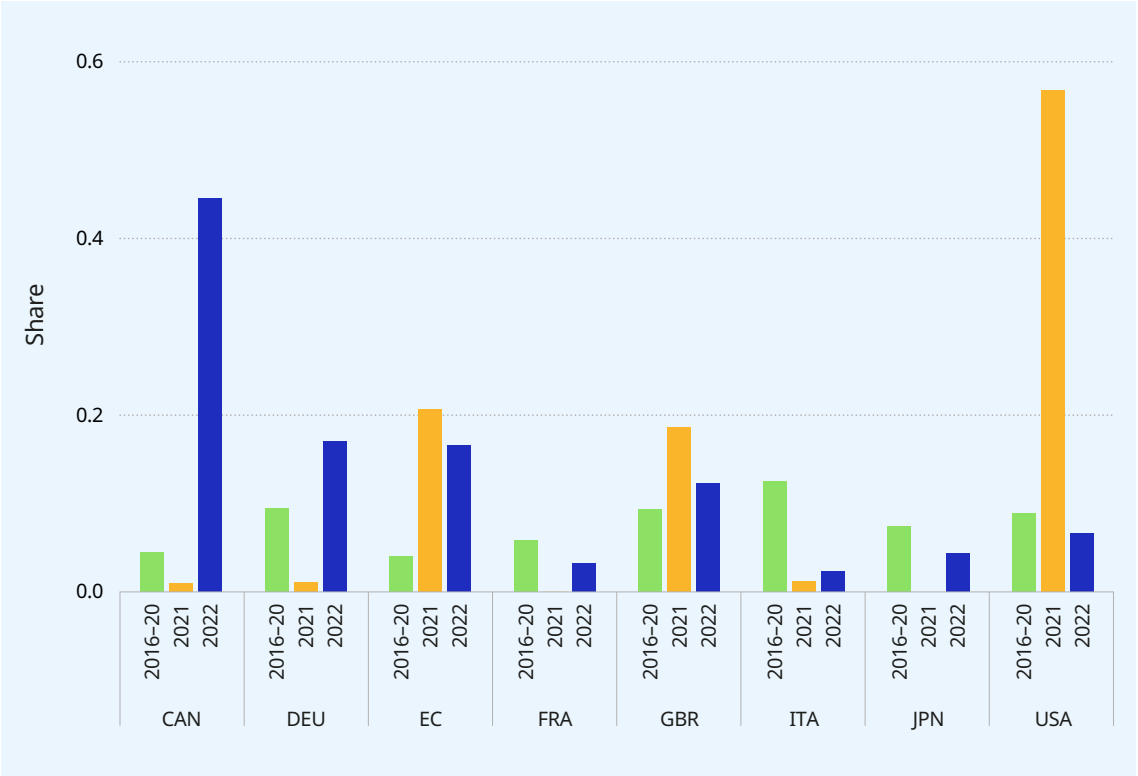

▶ **Figure A24. Share of green employment and skills promotion projects, by G7 donors + EC and year, based on disbursement amounts**



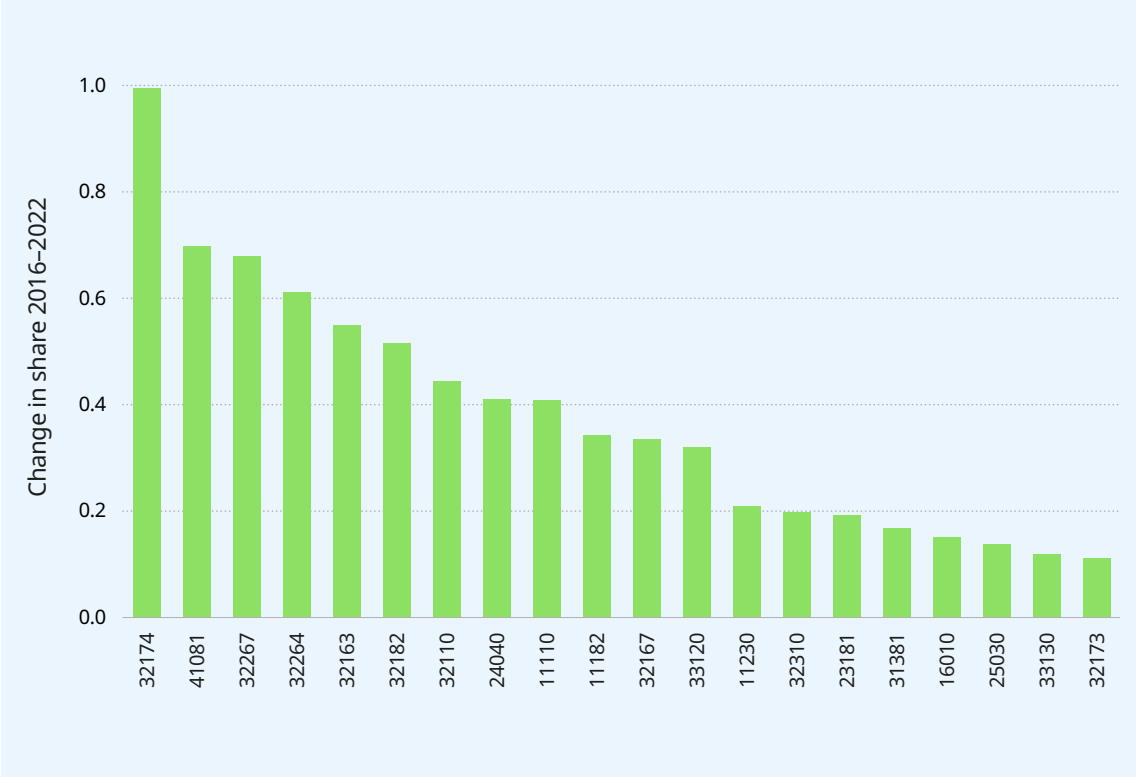
**▶ Figure A25. Yearly green ODA share based on commitment amounts, G7 + EC, including employment-relevant infrastructure**



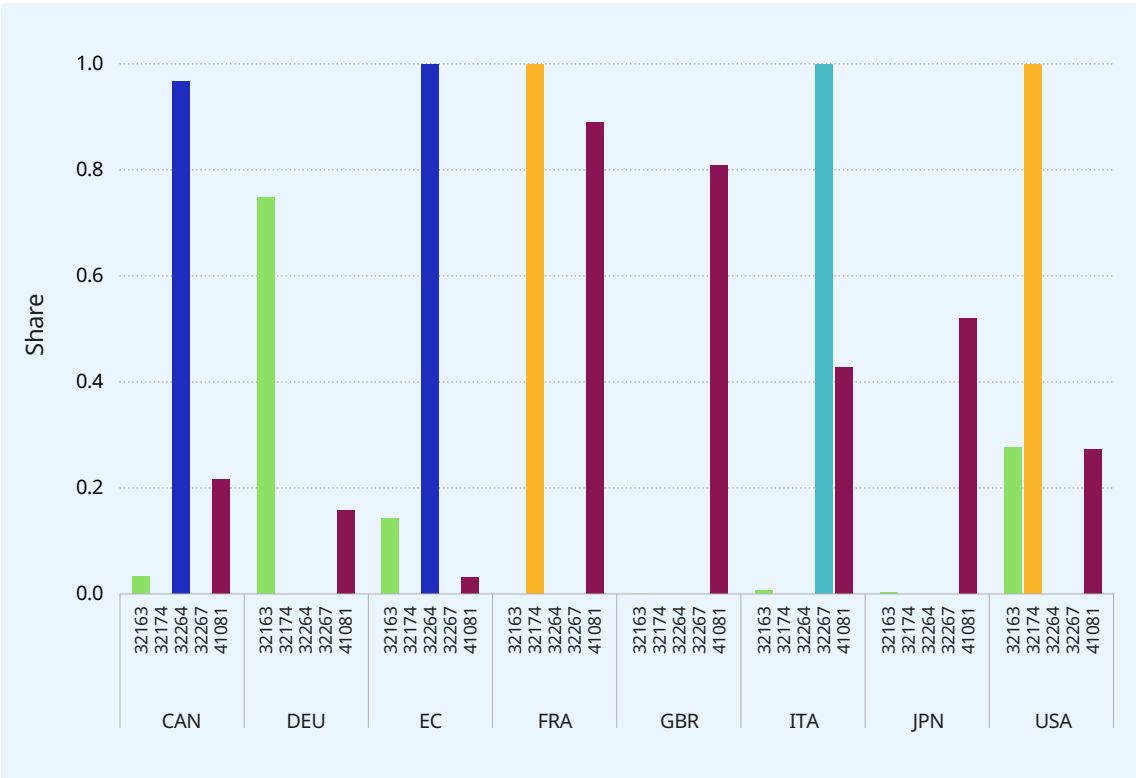

**▶ Figure A26. Green ODA share of G7 + EC donors based on commitment amounts – including employment relevant infrastructure**



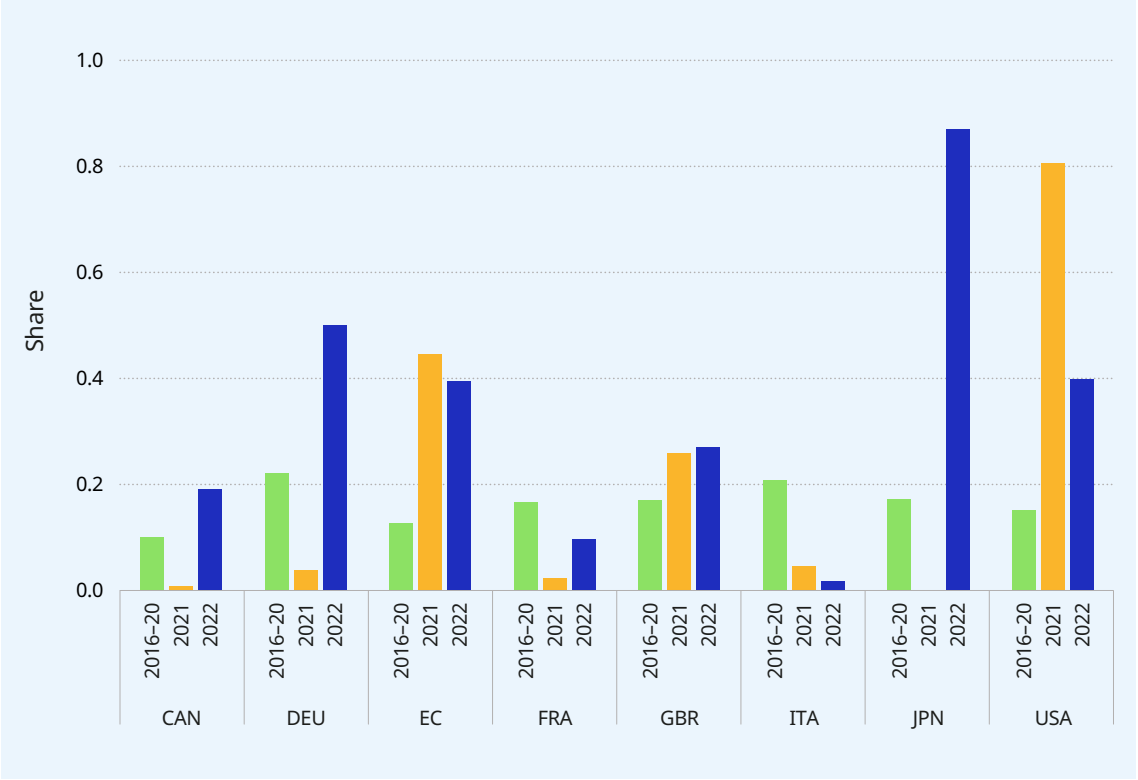
▶ **Figure A27. Changes in green share of commitments, 2016 to 2022 for top 20 sub-sectors under LLM approach**



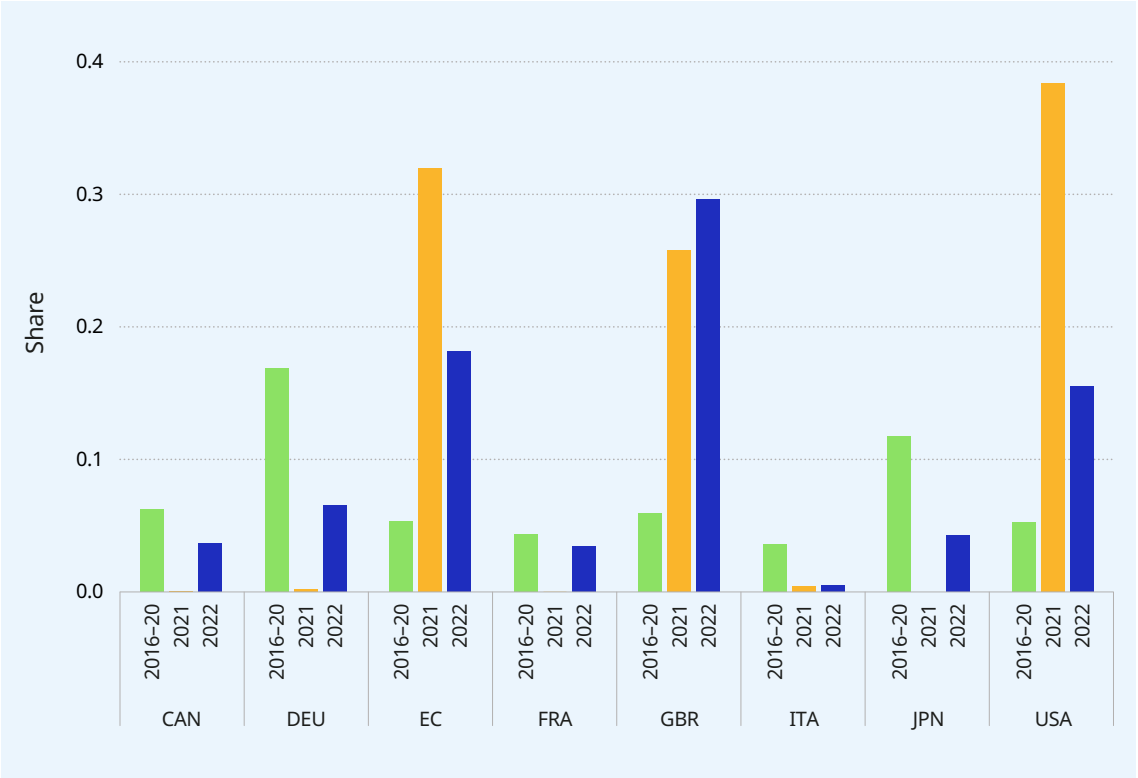

▶ **Figure A28. Donor green ODA share in top 5 fasters growing sub-sectors under LLM approach**



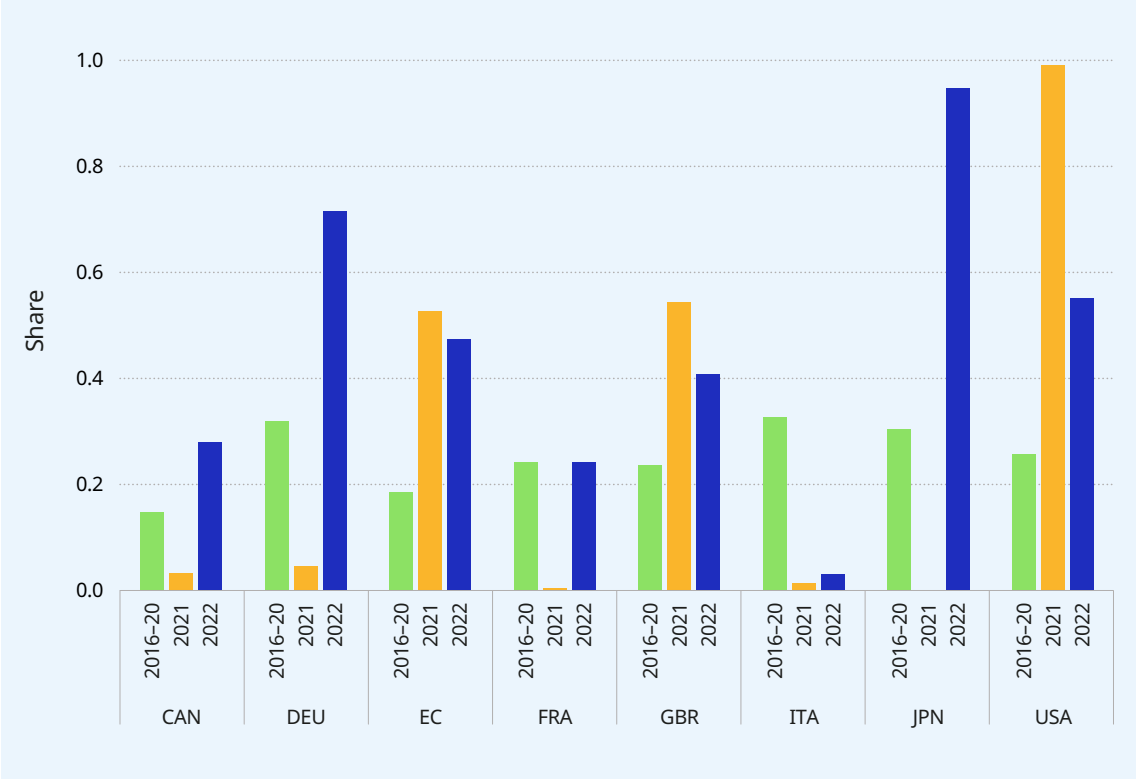
▶ **Figure A29. Green ODA share of G7 + EC donors by year -LLM matching with WB green projects**




▶ **Figure A30. Green ODA share of G7 + EC donors by year -LLM matching with UNDP green projects**



▶ **Figure A31. Green ODA share of G7 + EC donors by year -LLM matching with ILO green projects**



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