BRIEF ANALYSIS OF PUBLICATION OUTPUTS FROM THE HORIZON 2020 PROGRAMME

METHODOLOGY

Analysis of publication outputs from the Horizon 2020 programme (H2020)[1] was performed using the e-CORDA[2] database and the Web of Science database, Clarivate Analytics (WoS)[3]. A total of **69,349** records of publication outputs resulting from individual projects of the H2020 programme were included in the e-CORDA database as of 05/06/2019. The e-CORDA database classifies seven different types of publication outputs. More than half of the total number of publication outputs were articles in **Peer Reviewed Articles** (55 %) and almost a third (31 %) were articles in **Conference Proceedings**. The remaining 14 % of publications were distributed among **Book Chapters, Monographic Books, Thesis Dissertations, Articles** and **Others outputs**. The necessary detailed information on publications and their authors used in the analysis of publication outputs was obtained by linking the e-CORDA with the WoS, through the DOI[4]. Only 68 % of the publication outputs recorded in the e-CORDA database were identified with DOI. Less than 50 % of publication outputs from the e-CORDA database have been found and identified in the WoS database.

CHARACTERISTICS OF THE PUBLICATION OUTPUTS RESULTING FROM H2020 PROJECTS IN THE DIFFERENT AREAS OF THE HORIZON 2020 PROGRAMME BETWEEN 2014 TO 2019

The majority of the publication outputs from the H2020 programme registered by WoS database relate to ERC (European Research Council) projects, projects belonging to the LEIT pillar (Leadership in Enabling and Industrial Technologies) and projects implemented under MSCA (Marie Sklodowska-Curie actions).

Publication outputs resulting from H2020 projects of Societal Challenges pillar (SC), in particular SC1 – HEALTH, SC6 - SOCIETY and SC5 – ENV, have the highest citation impact (highest CNCI[5]). Publications from ERC, FET, MSCA and LEIT pillar are also widely cited. The publications from the H2020 projects were produced very often through international cooperation. The share of international publications[6] is highest in the projects of WIDENING (SEWP), EURATOM and INFRA where it reaches about 70 %. The percentage of publications created by co-authors from different countries is higher than 60 % in ENV, FET, and ERC priorities. The share of publications produced in cooperation with industrial enterprises[7] is much lower. It is highest in the LEIT pillar and the EURATOM programme where it is only 8 to 9 %.

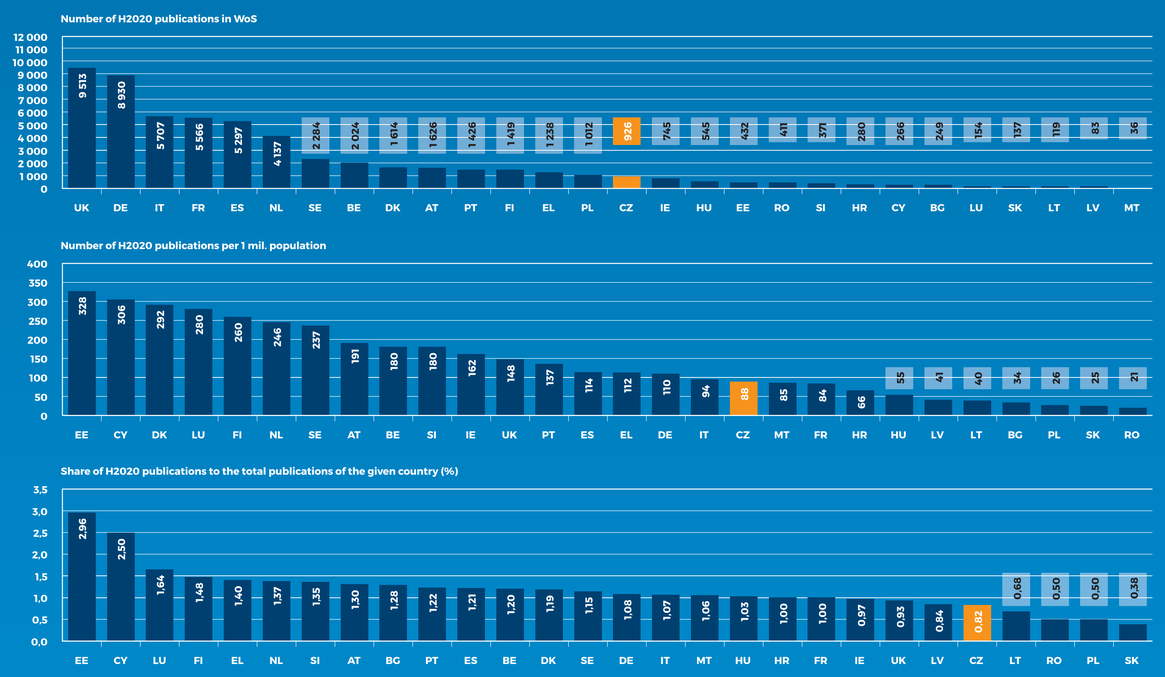
Figure 1: Numbers of publications resulting from H2020 projects in various areas of H2020 programme, their CNCIs and the shares of publications created through international cooperation or through cooperation with industrial enterprises.

COMPARISON OF PUBLICATION OUTPUTS OF EU-28 COUNTRIES IN H2020 PROJECTS: 2014–2018*

Authors from large EU-15 countries: UK, DE, IT, FR and ES (top chart) contributed to the highest number of publications resulting from H2020 projects. However, after recalculating the number of publications per million inhabitants, small countries: EE, CY, DK, LU and FI are at the top positions among the compared countries. (The CR ranks 20th but is fourth among the EU-13 countries.) Publication outputs from the H2020 programme represent the highest share of the total national production of publications in EE, CY, LU, FI and EL, while the lowest shares of H2020 publications are found in countries such as SK, PL, RO and LT. (The CR ranks low in her share of H2020 publications, namely, it is 24th). This share can be considered as one of the indicators of the importance of the H2020 programme in a given country, and the significance is growing higher especially for smaller countries that do not have extensive national support schemes for research and development.

Figure 2: Comparison of publication outputs of EU-28 countries registered in WoS database resulting from H2020 projects between 2014 and 2018

top chart – **Absolute numbers of H2020 publications in EU-28 countries**; middle chart – **H2020 publications per million population in EU-28 countries**; bottom chart – **Share of H2020 publications to total EU-28 publications registered in WoS database**



CITATION RESPONSE OF PUBLICATIONS FROM THE H2020 PROGRAMME AND THEIR SHARES PUBLISHED IN JOURNALS BELONGING TO THE HIGHEST QUARTILE (Q1): 2014–2018*

The normalized citation index (CNCI) of publication outputs is higher than 2 for authors of all EU countries. The ranking of EU-28 countries in terms of CNCI should be seen as very variable because the average of the CNCI index is calculated from very small numbers of publications (especially for the states at extreme positions in the chart), and it can be expected that the country ranking of the moment can change quite significantly in the coming years. It is clear that the citation index of publication outputs from H2020 projects is several times higher than that of other publications. The high citation rate may be due in part to the fact that a large proportion of H2020 publications have been published in top journals belonging to the highest quartile (Q1)[8]. H2020 publications are usually much more frequently published in Q1 journals than other national publications in all EU-28 countries, as shown by the ratio of share of H2020 publications in Q1 journals to the share of other publications in Q1 journals, which is higher than 1 for all EU countries.

Figure 3: CNCI and shares of H2020 publications published in top journals Quartile (Q1) with co-authors from individual EU-28 countries (upper two charts); **Elevation of CNCI and H2020 publications in Q1 journals compared to total national production of EU-28 publications** (bottom two charts).

SHARES OF PUBLICATION OUTPUTS FROM HORIZON 2020 PROGRAMME RESULTING FROM INTERNATIONAL COOPERATION AND COOPERATION WITH INDUSTRIAL ENTERPRISES: 2014–2018*

The high degree of international cooperation in the publication process may be a reason for the high citation impact of H2020 publications. It is well known that international cooperation of co-authors from different countries significantly increases the citation impact (Narin et al. 1991; van Raan 1998; Glanzel 2001; Gazni et al. 2012). The top left chart shows that the share of publications involving international cooperation in the H2020 programme is 70–90 %, which is a significantly higher share of international cooperation in all EU-28 countries except CY than can be found in national publications (bottom left chart). Cooperation with industry is less frequent in the H2020 programme. It is highest among authors from EE and DK where it reaches about 14 %. However, cooperation with industry under the H2020 programme is much more common for all the EU-28 countries (except MT) than for other national publications of the EU-28 countries (bottom right chart).

Figure 4 – Shares of H2020 publications created as a result of international cooperation and cooperation with industrial enterprises with co-authors from individual EU-28 countries (top charts). **Increase in the share of H2020 publications resulting from international cooperation and cooperation with industrial enterprises compared to the total production of publications of individual EU-28 countries** (bottom charts).

CONCLUSIONS:

The greatest share of publication outputs (almost 70 %) is connected with the projects of the first pillar of the H2020 programme Excellent Science (ERC, FET, MSCA, INFRA) which aim to reinforce and extend the excellence of the Union's science base and to consolidate the European Research Area in order to make the Union's research and innovation system more competitive on a global scale. More than one third of the total H2020 publication outputs found in WoS (more than 35 %) was generated as a result of ERC grants that support world-class researchers and their research pushing forward the limits of current knowledge – the so-called frontier research. The international dimension of the H2020 programme is reflected in the nature of the publications resulting from the implemented projects: Most of the publication outputs are of an international character, the citation impact of the publications is high and exceeds the citation response of other types of publications; the publication outputs from H2020 projects are presented very often in top research journals. This is valid for all the EU-28 countries. Nevertheless, the results of the publication analysis concerning the EU countries (especially their ranking) must be considered incomplete, as many projects are still being solved or are yet to be launched and the number of publication outputs is still low. However, there is no doubt that international cooperation (cooperation with leading foreign authors) and high citation of publications are one of the fundamental factors determining scientific excellence.

BASIC TERMS

[1] **Horizon 2020 programme: EC** – Cross-theme, **ERC** – European Research Council, **FET** – Future and Emerging Technologies, **INFRA** – Research Infrastructures, **MSCA** – Marie Sklodowska-Curie Actions, **LEIT** – Industrial Leadership, **INNOSUPSME** – Innovation in SMEs, **HEALTH** – Health, demographic change and wellbeing, **FOOD** – Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy, **ENERGY** – Secure, clean and efficient energy, **TPT** – Smart, green and integrated transport, **ENV** – Climate action, environment, resource efficiency and raw materials, **SOCIETY** – Europe in a changing world – inclusive, innovative and reflective Societies, **SECURITY** – Secure societies – Protecting freedom and security of Europe and its citizens, **WIDENNING (SEWP)** – Spreading excellence and widening participation, **SWAFS** – Science with and for Society, **EURATOM** – Euratom programme.
Detailed information about the Horizon 2020 programme and its structure: https://ec.europa.eu/programmes/horizon2020/en

[2] **e-CORDA (**External **C**ommon **R**esearch **DA**ta Warehouse) is a database containing data on applicants/proposals and signed grants/beneficiaries with regards to a specific Framework Programme for Research. Source: EC

[3] **Web of Science database, Clarivate Analytics (WoS)** is a website which provides subscription-based access to multiple databases presenting comprehensive citation data for many different academic disciplines. It was originally produced by the Institute for Scientific Information (ISI) and is currently maintained by ClarivateAnalytics. Source: Wikipedia

[4] **DOI (Digital Object Identifier)** is a unique alphanumeric string assigned by a registration agency (the International DOI Foundation) to identify content and provide a persistent link to its location on the Internet. Source: (American Psychological Association, 2017)

[5] **CNCI (Category Normalized Citation Impact)** is the average number of citations to a set of publications, normalized by publication, by type and by year. The set of all WoS registered publications has a CNCI = 1. CNCI values higher than 1 indicate that a given set of publications is cited more than is the average for the given field of research

[6] **International publications** – all publications that have authors from at least two different countries

[7] **Publications in cooperation with industrial enterprises** – all publications that have at least one of the authors affiliated to a private, profit-based company

[8] **Q1 journals** – the top quarter (highest quartile) of journals with the highest IF (impact factor) in each field of research

* The very low number of publications published in 2019 and the very short time to collect citations make the citation analysis of these publications outweighed by a major error, reflected in an increase in the average CNCI in 2019 compared to previous years. For this reason, 2019 was excluded from further analysis.
The following outputs of the analysis of publications in this report are therefore based on data on publications published between 2014 and 2018.

LITERATURE:

Narin, F., Stevens, K., & Whitlow, E. S. (1991): Scientific co-operation in Europe and the citation of Multinationally authored papers. Scientometrics, 21, 313–323. DOI:10.1007/BF02093973

Van Raan, A. F. J. (1998): The influence of international collaboration on the impact of research results: Some simple mathematical considerations concerning the role of self-citations. Scientometrics, 42(3), 423–428. https://doi.org/10.1007/BF02458380

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Gazni, A., Sugimoto, C. R., & Didegah, F. (2012): Mapping World Scientific Collaboration: Authors, Institutions, and Countries. Journal of the American Society for Information Science and Technology, 63(2), 323-335. DOI: 10.1002/asi.21688

DATA SOURCES

Analytic data: e-CORDA H2020 grants and participants: data extraction date 05-06-2019; WoS – Clarivate Analytics, June 2019

Note: This poster was based on a comprehensive analysis of publications which is part of the Report on the Czech Republic's Participation in the H2020 Programme in the period of January 2014 – May 2019, published in ECHO – 3-4 / 2019; https://www.tc.cz/en/publications/periodicals/list-periodicals/echo

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