FINANCIAL FLOWS IN SWISS PUBLISHING

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FINAL REPORT

Prepared by

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On behalf of

SWISS NATIONAL SCIENCE FOUNDATION (SNSF)

SUC P-2 PROGRAM "SCIENTIFIC INFORMATION: ACCESS, PROCESSING AND SAFEGUARDING"

EXECUTIVE SUMMARY

Rationale for the study

Background

The Swiss National Science Foundation (SNSF) and swissuniversities' funding programme "Scientific information: access, publishing and safeguarding" have commissioned CEPA, in conjunction with Professor John Houghton, to undertake a study on the financial costs and benefits of a transition to Open Access (OA) for the Swiss scientific research community. The SNSF, the programme "Scientific information" and swissuniversities have contributed to recent developments in Open Access and this study forms part of further policy evolvement.

Project scope

The report has two main objectives. On the one hand, it represents the first attempt to collect transparent data on the Swiss current scientific publications system. On the other, it aims at answering the question which OA models would best support a full OA transition in Switzerland. The data for books appears less robust and so in the report we focus on research articles.

Terminology

In a broad sense, OA indicates that there should be free of charge and free for re-use access to publications for the end-user, with a number of variants.

Broadly speaking, there are two main paths to OA: 'Green' OA where a party deposits an article into an online repository, and 'Gold' OA where an article is published for free access with a one-off payment from an author (where charged), known as an Article Processing Charge (APC).

Despite the existence of well-established documents such as the Berlin Declaration,[1] there is no consensus definition of what represents OA. In this report, we refer to the SHERPA/RoMEO colour terminology for OA.[2] Within 'Green' OA, we distinguish between pre-print archiving ('Yellow') and post-print archiving ('Blue'). We refer to the system of subscription charges as the conventional model. For journals, there also exists a hybrid model where the journal requires a subscription, but certain articles within the journal may be made OA following payment of an APC.

Mapping current flows

Data collection

On a bottom up level, we utilised two main sources of data as part of this assignment. We developed both a qualitative questionnaire and a quantitative questionnaire that were shared with 54 institutions. We received responses from 35 institutions to the quantitative survey and from 52 institutions to the qualitative survey.

[1] Access to this is available at: https://openaccess.mpg.de/Berliner-Erklaerung
[2] Access to this is available at: http://www.sherpa.ac.uk/romeoinfo.html

For our top down level analysis, we reviewed the relevant scientific literature and utilised public bibliometric studies, such as Swiss Statistics or the SNSF Open Access Monitoring Report 2016, and the analysis conducted by the Max Planck Digital Library (MPDL) for this study.[3]

Map of current flows

It is important to note that there are both physical and financial flows with publishing. The physical flows correspond to articles and books, while financial flows could be for subscriptions, publishing costs or for associated infrastructure.

In Switzerland in 2015, we estimate using data gathered on this project that:

- 30,844 articles were published under all publishing models in Switzerland; and
- 2.57m articles were subscribed to.

For the financial flows associated with these physical flows in 2015:

- CHF 70m was spent on subscriptions;
- CHF 6m was spent on publication fees; and
- CHF 2m was spent on infrastructure supporting OA.

This is part of an overall research budget of CHF 9.6bn, with the ten biggest institutions accounting for over 80% of expenditure.

In terms of articles produced, Switzerland has a lower proportion of conventional articles than the world (70% compared to 78%). There is an 11% share of Gold OA, a 16% share for Blue OA and 3% for Hybrid, according to our estimates.[4]

Modelling ways to OA transition

Selection of OA models

According to the literature, we made up a longlist of practicable OA business models. In order to assess the different models we used a set of assessment criteria. These guided us in the selection of different models to analyse financial flows, as well as determining the overall recommendation. The set of criteria was divided between mandatory and additional criteria.

The mandatory criteria require the OA models to:

- represent OA publishing;
- be acceptable to key stakeholders; and
- allow that the scientific work financed under the model is of appropriate quality (peer review).

[3] Max Planck Digital Library (2016) Analysis of the international journal publishing activities in Switzerland with special emphasis on Open Access Gold publishing.
[4] This compares to global figures of 14% Gold, 5% Blue and 3% Hybrid under our modelling.

In the longlist of OA models, three models met these criteria: Gold OA, Blue OA and Hybrid with offset.[5] Together with mixed models they constitute the shortlist of OA transition models, which were studied afterwards.

The hybrid option however is not considered a suitable long-term model (in part due to issues such as 'double dipping' and reinforcement of the big publishers' position) and so this would be limited to the transitional phase (possibly in conjunction with the other two models).

The additional criteria are whether the model:

- meets the needs of researchers;
- facilitates international partnerships;
- requires a large degree of financial restructuring;
- is impactful (e.g. in terms of readership and citations); and
- is supported by traditional publishers.

They are not given equal weights, but help guide a recommendation.

Analysis of the OA transition models

Based on the financial map of current flows, we first developed a Business as Usual (BaU) transition path corresponding to the projection of the actual scientific publishing system. The scenarios rely on the following basic assumptions:

- 5% increase rate on publications volume;
- constant global production split;
- full transition to the model by 2024, bridge transition in 2020;
- embargo period of one year;
- hybrid articles fully offset from subscription expenditure;
- prices are not adapted to change in article production and consumption;
- modelling in real terms; and
- 100% back access to previously subscribed content.

Secondly, we modelled transition paths for each shortlisted OA model where the split between OA models was adapted as to study the transition path of each shortlisted OA model.

Because there cannot be complete certainty when modelling the future, we thirdly utilised scenarios i.e. different states of the world, and sensitivities i.e. testing the results against changes in an input assumption. We found that the actions taken by other countries in terms of Gold OA are a major cost driver for Swiss publishing costs because where publications from other countries become OA, they are then freely available to Switzerland, rather than requiring subscriptions. If the rest of the world

[5] Offsetting refers to where APCs are offset against subscription fees for the journals that an institution is already subscribing to.

moves to 50% Gold OA, all models in Switzerland are likely to deliver cost savings relative to the status quo.

Fourth, we calculated the difference between the BaU and the transition path of each shortlisted model, plus the relevant infrastructure cost, which equates to the net funding requirement of the transitional OA model. In this manner, we were able to understand the impact of each publishing model.

Results and conclusions

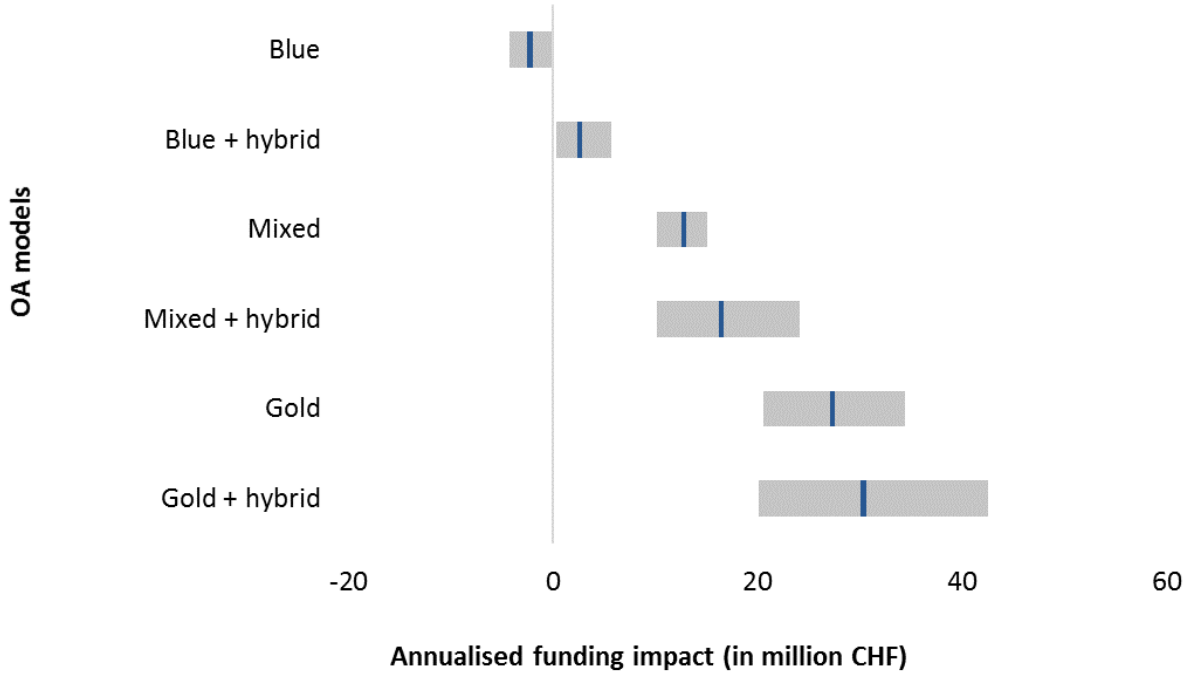
Limitations

While we have gathered a range of information from institutions, this is not complete for all institutions and there is a degree of uncertainty around some of our input assumptions e.g. number of article produced. We tried to compensate for these limitations by cross-checking data and by including - where possible - not only a central estimate but also uncertainty ranges. Still, it is important to consider these limitations for the interpretation of the data.

Impacts by publishing model

Looking at the financial impact over a ten-year period (2015-2024), the Blue OA model represents the most cost effective option for Switzerland, with an annual saving against the status quo of CHF 2m p. a. The most expensive option is Gold OA with hybrid transition. This requires an additional CHF 30m p.a. of funding. This additional amount is large relative to current subscription and publication expenditure (29.8%), but less significant when compared to overall research expenditure (0.31%). The results, including a range demonstrating uncertainty, are shown below.

Figure 1: Total annualised impact per models and uncertainty ranges for articles only



Source: CEPA analysis

The driver of additional cost under Gold OA stems from the requirement to subscribe to those articles produced globally (Switzerland represents less than 2% of global production) through conventional channels, but pay APCs for producing Gold OA.

In terms of distributional impacts, 12 of the 35 institutions for whom we had financial data would be affected by 20% or more in our Gold OA model. However, the financial cost is only one aspect of our analysis.

From modelling different scenarios, we found that the actions taken by other countries in terms of Gold OA is a major driver for Swiss publishing costs. If the rest of the World moves to 50% Gold OA, all models in Switzerland are likely to deliver cost savings relative to the status quo.

Conclusions

The Gold OA model will be higher cost than Blue OA in the transition phase, but demonstrating the commitment to such an approach (in light of the higher costs) would establish Switzerland as a leader on the world stage and could facilitate more swift transition to Gold OA by other countries. The Gold OA model may be more competitive in terms of the market structure of publication than a Blue OA model and it may be possible that such a model leads to less market power exhibited by a select number of publishers.

The Blue OA model is more likely to be compatible with Switzerland's main international research partners (USA, Italy, Germany and France), in the short run, as well as being more consistent with book publishing and open data. The immediate cost savings are a plus, but this is based on the assumption that moving from conventional to Blue OA does not encounter significant cost rises in response to this transition.

A hybrid approach as part of the transition scored less favourably with our mandatory assessment criteria and our modelling indicated that this leads to higher costs. As such, we narrow our choice down to Gold OA and Blue OA.

Recommendations

Recommended model

From the qualitative questionnaire, there is no consensus around the best approach to OA, and there are arguments in favour of both Gold and Blue OA approaches.

In the long term, a global Gold OA model is likely to be preferable to Blue OA. However to get to a Gold OA world is likely to encounter more difficulties, including higher costs and international research partnerships that are more compatible with Blue OA than Gold OA. Therefore, there is a balance to be struck between the practical and the theoretical.

Given the role of international players in the success of different models, we would recommend that a Mixed Model i.e. utilising both Gold and Blue OA models, as it provides flexibility and more of a pragmatic approach to transitioning to OA publishing. As data quality increases and a clear objective is set out, this could then lead to greater focus being placed on one of the two models.

Recommended implementation actions

There are a number of steps that can be taken to put Swiss publishing in a stronger position. This includes both short term and longer term actions. In the short term, the actions are:

1. Improving the quality of data collected and shared to get clear views on physical and financial flows over time (this could involve revising the questionnaires circulated and putting systems in place to facilitate the response to this).
2. Improving coordination and communication to ensure clear support for an OA path and objectives of a model. This will keep momentum behind the transition and the National Strategy represents a key part of this. This will require an Action Plan to set out milestones and actions, as well as reviews of policy.
3. As the problem at hand requires coordinated action to bring about success, Switzerland should continue to be active in international discussions on OA and demonstrate leadership, both in actions and in words, to bring about change for the better.

There are also a set of recommendations over a longer time horizon:

4. There will be a decision to take on whether to directly support the transition of certain journals to OA, where moving to OA is more difficult (for example, journals with high revenues from conventional subscriptions). This choice depends on how involved and the extent to which funders want to achieve full OA as the marginal cost for conversion will increase.
5. While we have modelled the impact under a set of assumptions, in the real world, the cost impact will be a function of the bargaining power that Swiss institutions can command against those sitting on the other side of the table. Where institutions are unified and act in a concerted fashion, this can lead to benefits.
6. With OA, there will be an increasing need to store more articles. The infrastructure to facilitate OA needs to be developed, with a clear plan of action (for example, this could be through institutional repositories, or through subject repositories). Smaller institutions have indicated anticipated benefits from joining infrastructure.

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1. INTRODUCTION

1.1. Background for our report

The Swiss National Science Foundation (SNSF), supported by the program 'Scientific information: Access, processing and safeguarding' (SUC-P2)[6] run by swissuniversities, have asked CEPA to examine the costs and benefits of a transition to Open Access (OA) for the Swiss scientific research community. The steering committee for this report was composed of Ingrid Kissling (SNSF), Gabi Schneider (SUC-P2), Axel Marion (swissuniversities), Arlette Piguet (ETH-Bibliothek), Jean-Blaise Claivaz (University of Geneva), and Thomas Zimmermann (SNSF), supported by Chloé Gay-Balmaz and Lionel Perini from the administrative office of the SNSF.

Objective of the project

The project involves assessing: (1) the flows of public funds used in the current scientific publishing system in Switzerland; and (2) the different options to transitioning to OA publishing and the distributional implications on Swiss institutions of doing so.

To find out about the financing requirement of different OA models we have undertaken the following activities:

- We have mapped the current flows of scientific research in Switzerland. These flows include the research inputs (research articles and books being consumed by Swiss universities and libraries) and outputs (the production of articles and books), as well as the income (public funding received) and expenditure (subscription expenditure by libraries, article charges or infrastructure costs) as reported by Swiss stakeholders. Note however, that there are data limitations and we have had to make a number of assumptions to overcome those limitations. More details can be found in Annex C.
- We have assessed potential OA models that could be supported by public funding.
- We modelled future financial flows in Switzerland under different scenarios. This modelling allows us to provide an estimate of the total funding requirement for Swiss public funders, as well as distributional impacts of different options on Swiss stakeholders. We provide recommendations on the most appropriate model for Switzerland and discuss its implementation.

[6] https://www.swissuniversities.ch/isci

Drivers of the report

A study by the Max Planck Digital Library (MPDL)[7], in 2015, found that a full transition to OA would be possible at a global level through redeployment of current funding.[8] There are several national level studies, including whether a budget-neutral transition is possible (see our literature review). Analysis at the Swiss level has not been conducted, leading to the commissioning of this report.

SNSF and many large institutions in Switzerland have policies towards OA. There have been a number of recent developments in the field, most notably the Competitiveness Council of the European Union set a target for all scientific papers to be made freely available by 2020.[9]

At the end of 2015, the State Secretariat for Education, Research and Innovation (SERI) mandated that swissuniversities, in collaboration with SNSF, draw up a national OA strategy for Switzerland. The task was assigned to the Strategic Planning Delegation.

The Working Group National Strategy Open Access is currently drafting a reference document that will be available in Autumn 2016 and signed by different stakeholders in 2017. An action plan is anticipated to be elaborated in 2017. Our analysis could provide additional context for further defining this strategy.

1.2. What is Open Access?

Definition of Open Access

While no consensus version of OA exists, there are key definitions contained in both the 2002 Budapest Declaration and the 2003 Berlin Declaration. In broad terms, this means that there should be free of charge access for the end-user and with ability to re-use, although there are a number of models within the OA categorisation. The definition of an OA contribution in the Berlin Declaration is[10]:

"Open access contributions must satisfy two conditions: The author(s) and right holder(s) of such contributions grant(s) to all users a free, irrevocable, worldwide, right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship (community standards, will continue to provide the mechanism for enforcement of proper attribution and responsible use of the published work, as they do now), as well as the right to make small numbers of printed copies for their personal use. A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in an appropriate standard electronic format is deposited (and thus published) in at least one online repository using suitable technical standards (such as the Open Archive definitions) that is supported and maintained by an academic institution, scholarly

[7] MPDL (2015) "Disrupting the subscription journal's business model for the necessary large-scale transformation to open access", April 2015.
http://pubman.mpdl.mpg.de/pubman/faces/viewItemOverviewPage.jsp?itemId=escidoc:2148961
https://www.mpg.de/9202262/area-wide-transition-open-access

[8] However, a recent study for the University of California 'Pay It Forward Project' found that a move to Gold OA would increase costs for intensive research producing institutions, while institutions not producing much research but consuming a lot facing lower costs.

[9] The Competitiveness Council includes Ministers of Science, Innovation, Trade and Industry in Europe.

[10] https://openaccess.mpg.de/Berlin-Declaration

society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving."

OA versus OA publishing

There is a distinction in terms of OA between articles that have been (peer-)reviewed and those which have not. We refer to (peer-)reviewed publications under an OA model as OA publishing. Where there is not peer review, this may be OA but we would not consider it OA publishing. This is important as a (peer-)reviewed publication will have an additional cost and be of increased quality relative to a pre-print non-(peer) reviewed article or book. In modelling financial flows, failing to take into account this difference can lead to misleading results.[11] In addition, there may be further issues around licensing and usability differences between different OA models.

What different OA models exist?

There are two main paths to OA:

- 'Green' OA (self-archiving) – a party deposits an article into an online repository; this may be before, simultaneously or after publication. There are variants within this form of OA, concerned with whether the article is peer reviewed or not (see next section).
- 'Gold' OA (a form of open access publishing) – an article is immediately published in open access form, with the payment associated with Gold OA being one-off payments by authors, known as Article Processing Charges (APCs). However, APCs may not always be charged.[12]

The use of colours aims to provide standardised terminology around different open access models, however this can vary quite significantly and clarity is required when describing a model.[13]

It is important to note that Green and Gold OA channels are not mutually exclusive and depend on different business models. A Gold OA article, namely one published in an OA journal, is able to be freely re-used, so may be archived as part of a Green OA route.

Green OA models

Green OA refers to a type of publishing model, but also acts as an umbrella term for Yellow and Blue variants of OA models. We rely on the SHERPA/RoMEO definition.[14] The definition for Green OA covers an article that is archived in a repository, but this may be pre-print (i.e. without (peer)review) or post-print (i.e. following (peer)-review). We do not see pre-print as an OA publishing model, while post-print is.

Colour codes are used to describe these models:

[11] In our modelling, we assume that journals undertake the (peer)-review. In practice, there are other parties who would be able to do this – however we do not have clear information on such editing costs.
[12] As of August 10th 2016, the DOAJ indicates that there are 9,158 OA journals, of which 1,608 charge APCs, 2,964 do not, with no information on the remaining 4,586.
[13] Further information can be found at http://www.sherpa.ac.uk/romeo
[14] http://www.sherpa.ac.uk/romeo/definitions.php?la=en&fIDnum=|&mode=simple&version=#colours

- 'Yellow' is used to describe pre-print archiving i.e. where an article has not been reviewed and is deposited into a repository.
- 'Blue' is used to describe post-print or publisher version archiving i.e. where an article has been reviewed and is deposited into a repository.

Gold OA

The central version of Gold OA involves payment of an APC to make the publisher version of an article Open Access. However, there are variants where authors are not charged. This may be called 'Platinum OA' where the costs associated with publication are covered by others, including through volunteering, donations, subsidies and grants.

According to the Directory of Open Access Journals (DOAJ), out of 149 OA journals based in Switzerland, only 17 charge APCs. In our model we base our estimates on total APC costs divided by the number of Gold OA articles; this gives a weighted APC.

Conventional model

We use the term 'conventional' to describe the system of subscriber charges that are used to pay for content that is not OA. This may be referred to in other studies as traditional publishing models.[15]

Hybrid model

A hybrid OA journal is a subscription journal where the publisher version of some of the articles are open access, while the remainder are covered by subscription charges. Authors can pay an APC for making the article in a conventional journal into OA.

Other variants

Where a hybrid model is used there is an issue of 'double dipping', where an institution could pay an APC for an article within a journal that they pay a subscription for at present. Offsetting relates to the concept of allowing institutions to offset APC charges against the subscription fees that they pay. A hybrid model with an offset model may be seen as more of a transitional step to OA as it is not OA in itself.

Gratis and Libre do not represent forms of publications, but characteristics of these. Gratis represents free pricing, whereas Libre represents free pricing and removes barriers to re-use. We do not distinguish between these options in our publication models, however licensing conditions are an important feature.

Books publishing

In this report we focus on articles rather than including books. The information we have on books is more limited than on articles and we do not have the same cross-checks that we have on articles to ensure that the results are suitably robust.

[15] Noting that the term 'Toll Access' may be used to cover both journal subscriptions and book payments.

In Annex G we include indicative results were books to be considered – however we would recommend placing primary weight on the results presented in the main body on articles only.

Definitions of models

We have sought to define the different models by their characteristics. These models form the longlist for choices around developing an OA publishing model.

Table 1.1: Features of OA models

Model	Payer	Payee	Payment	Version	Availability	Usage rights	Location
Gold OA	Authors	OA publisher	APC*	Post-print	OA at publication	Gratis/Libre	Publisher / repository
Yellow OA	NA	NA	NA	Preprint**	OA at publication	Gratis/Libre	Repository
Blue OA	Readers	Traditional publisher	Subscription until embargo	Post-print	OA after embargo	Gratis/Libre	Publisher / repository
Hybrid OA	Authors/ Readers	Traditional publisher	APC + subscription	Post-print	Not OA	Barriers	Publisher's site
Hybrid & offset* **	Authors	Traditional publisher	APC – offset + subscription	Post-print	Not OA	Barriers	Publisher's site

** APCs are not charged all of the time. ** This form of OA is not considered as OA publishing. *** Offsetting is an arrangement taken with publishers to discount the articles already been paid for in APCs. We focus on the OA articles within a hybrid journal, which is why the payer does not include consumers.*
Note 1: Gold does not necessarily involve author fees, as discussed previously.
Note 2: Blue OA involves readers paying initially during an embargo period, but not at the time of becoming OA.
Note 3: NA on Yellow OA model is because there are no direct financial flows i.e. payments, only indirect flows e.g. for infrastructure.

2. BACKGROUND

2.1. Role of SNSF and swissuniversities

SNSF

SNSF supports OA and requires recipients of funding to provide free access to research results. With respect to the Green OA route, researchers are obligated to self-archive in an institutional or specialist repository in addition to having it published in a journal. SNSF also supports the Gold OA route by enabling researchers to cover the costs of direct publications in pure OA journals via their project budgets.

OA principles of Science Europe

SNSF is an active participant in Science Europe, an umbrella organisation representing 51 member organisations. The aim is to make available research and innovation funding by public money in Europe free of charge. In April 2013, Science Europe set out ten principles for the transition to OA.[16]

The benefits of OA were noted as being improving the pace, efficiency and efficacy of research, and heightening the authors' visibility (and thus the impact of their work). This removes barriers to the circulation of knowledge and facilitates collaboration.

OA Monitoring Report

In May 2016, SNSF published a monitoring report on 2013-15 and the role of OA in publishing.[17] This follows recommendations from Science Europe that OA monitoring and cost reporting be introduced.

The report included the share of OA in SNSF funded publications and the indicative costs for different publishing models. The study also noted that it was important for Switzerland to keep pace with international developments and continue their progress in moving towards OA.

swissuniversities

Together with the SNSF and in collaboration with the Conference of Swiss University Libraries, swissuniversities is currently developing a National Strategy. This will be followed by an action plan around OA. This also involves cooperation at the European level and stakeholder engagement.

The programme "Scientific Information: Access, processing and safeguarding (SUC-P2)", overseen by swissuniversities, is developing national solutions in the field of digital scientific information. Decisions have been taken to establish a network of services for the Swiss scientific community that allows easy access to publications and data, providing tools for processing and safeguarding them. The program funds projects aimed at improving OA infrastructures. The present funding period ends in December 2016, and the program is heading for a second funding period from 2017 to 2020.

[16] Science Europe (2013) Open Access Position Statement, Principles for the transition to Open Access to Research publications, April 2013.
http://www.scienceeurope.org/uploads/Public%20documents%20and%20speeches/SE_OA_Pos_Statement.pdf

[17] SNSF (2016) Open Access Monitoring Report, October 2013 to August 2015, May 2016.
http://www.snf.ch/SiteCollectionDocuments/Monitoringbericht_Open_Access_2015_e.pdf

2.2. SNSF– role in OA internationally

The SNSF is a signatory to the League of European Research Universities (LERU) statement on OA, tied to the Dutch EU presidency in 2016.[18] This statement sets out that OA is a cornerstone of the new research paradigm and business models must support a transition to this. SNSF is supportive of the Amsterdam Call for Action 2016.

The SNSF has also signed the OA2020 Initiative, set out in December 2015 in Berlin.[19] This calls for a swift and efficient transition of scholarly publishing to OA.

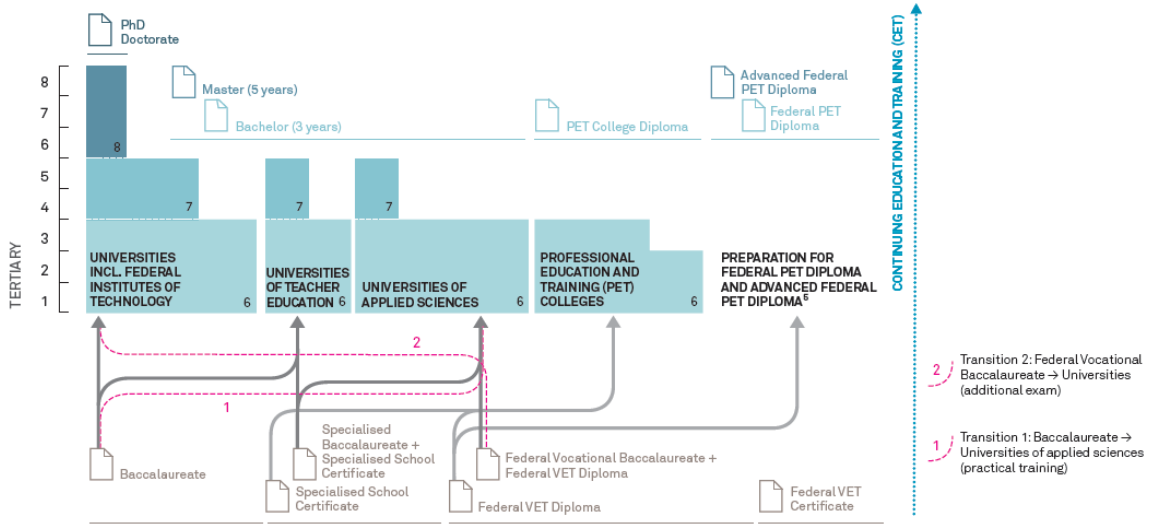
This year also sees the second round of the OAPEN-CH project, in which the SNSF is working with publishing houses to learn more about the OA publication process for books.

SNSF has played and will continue to play an active role in international developments relating to OA. We discuss such developments and the broader global context in more depth in Annex B.

2.3. Background on type of institutions

The Swiss Higher Education system is described in the Figure 2.1: Representation of the Swiss Higher Education System from Swiss Conference of Cantonal Ministers of Education (EDK) below.[20]

Figure 2.1: Representation of the Swiss Higher Education System



Source: *Swiss Conference of Cantonal Ministers of Education (EDK).*

Higher Education Institutions (HEIs)

Article 63a of the Federal Constitution of the Swiss Confederation (the Confederation), sets out that the Confederation and cantons are responsible for a competitive and high quality higher education system. This system consists of Swiss federal institutes of technology and cantonal universities,

[18] http://www.leru.org/index.php/public/extra/signtheLERUstatement/
[19] http://oa2020.org/
[20] http://www.edudoc.ch/static/web/bildungssystem/grafik_bildung_e.pdf

universities of applied sciences, universities of teacher education and other institutions. Recognised Swiss Higher Education Institutions include[21]:

- ETH domain institutions (6)
- Cantonal Universities (10)
- Universities of Applied Sciences (9)
- Universities of Teacher Education (17)
- Other Higher Education Institutions (HEI) (7)

As part of the analysis, we include four academies and one research funding organisation (SNSF).

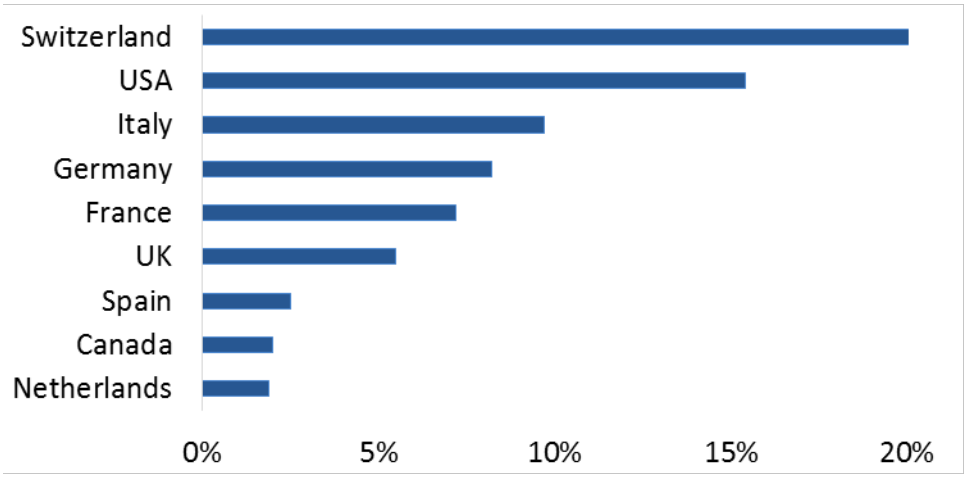
Consortium of Swiss Academic Libraries

The Consortium of Swiss Academic Libraries[22] is an organisation located at ETH Zurich, the Swiss Federal Institute of Technology in Zurich. The Consortium of Swiss Academic Libraries is the main negotiator concerning national licences. Consortium partners are always free to participate or not in a deal. They are also free to opt out of a negotiation and negotiate a local license instead of a Big Deal. This creates greater flexibility, but may lead to less negotiating power for Swiss institutions.

2.4. Features of Swiss publishing system

A shown in Figure 2.2, the Swiss publishing system is unique in the degree of international collaboration between authors – this means that international harmonisation becomes a critical issue. The countries Swiss authors publish most frequently with are noted below – most frequently, Swiss authors publish with other Swiss authors.[23]

Figure 2.2: Proportion of total Swiss articles involving collaboration with other authors (%)



Source: SERI (2016) Bibliometric study

[21] https://www.swissuniversities.ch/en/higher-education-area/recognised-swiss-higher-education-institutions
[22] http://lib.consortium.ch/html_wrapper.php?dir=project&src=project-ea&activeElement=2&ea=1&lang=2
[23] SERI (2016) Bibliometric analysis of scientific research in Switzerland, 1981-2013

The study indicates that in the period 2009-2013 period, Switzerland had a rate of international partnerships (78%) that was only behind Russia in the most frequent rates of international collaboration, according to the SERI study.

3. METHODOLOGY

This section details the methodology we used to assess the optimal model and transition path to OA publishing in Switzerland. Our approach can be summarised as follows:

- **Phase 1**: We first collected both qualitative and quantitative financial and bibliometric data and reviewed the literature on OA. The data collected is used as input to the financial model to support our quantitative assessment of the cost of transition to OA.
- **Phase 2a:** We identified a short-list of relevant OA publishing models.
- **Phase 2b**: We developed a tool to forecast and simulate the impact of each of the shortlisted OA models on a financial basis.
- **Phase 3**: Findings from the simulation allow us to provide recommendations on the most appropriate options for moving to OA publishing models.

3.1. Phase 1: Data collection and literature review

We collected data from three main sources:

- **Quantitative questionnaire:** We developed a template for institutions and libraries to complete on their financial and physical flows with respect to scientific research in Switzerland.
- **Qualitative questionnaire:** We gathered views from Swiss stakeholders on the current status of OA in Switzerland and its anticipated development.
- **Public statistics:** We used publicly available statistics on Swiss and global publishing trends.

We describe the content of this data in more detail in the remainder of this section.

Quantitative questionnaire

We received information from 31 universities and 38 libraries. A full list of institutions that were contacted can be found in Annex C, where we also detail the answers that were provided to the questionnaires.[24] These flows are:

- *Financial inflows* - We asked universities to report the total **income** they received and its allocation across research, publication, subscriptions, teaching and other segments.
- *Financial outflows* - We asked libraries for data on **expenditure** on subscriptions and publications. In addition, we asked for **expenditure** on OA infrastructure; e.g. repository.
- *Physical inflows* – We asked libraries for data on the number of journals, articles and books **consumed**; i.e. acquired through subscription packages.
- *Physical outflows* – We asked libraries for the number of articles **produced** and the number of articles placed in repository by subject.

[24] We note that we include the answers rather than analyse the quality of the answers, for example, with data being available and where there have been different interpretations.

Qualitative questionnaire

52 institutions – research institutes, funders, universities and libraries – responded to a qualitative questionnaire. They were asked a range of questions that can broadly be categorised as follows (details are contained within Annex C):

- ***OA policy***: The OA-related activities that institutions are currently engaged in.
- ***OA strategy***: The future intentions of institutions with respect of OA publishing.
- ***OA infrastructure***: The supporting infrastructure required to support the OA policy and strategy.
- ***National Strategy***: The expectations of institutions with regards to the National Strategy.

Answers from the questionnaire provided us with a broader understanding of the state of OA publishing in Switzerland. The answers supported development of certain model inputs - for example, the questionnaire data allowed us to estimate the number of repositories existing in Switzerland across HEIs.

Additional data sources

We complemented our primary data with publicly available statistics, including Swiss library statistics, Swiss higher education institution statistics, bibliometric analyses, and the analysis conducted by the Max Planck Digital Library (MPDL) for this study.[25] For the full list of indicators considered and their sources, please refer to Annex C.

We also collected international statistics. As noted previously, the development of OA in Switzerland cannot be considered in isolation to developments in the rest of the world. This is because the cost faced by Swiss institutions depends heavily on developments abroad. For example, if the rest of the world as a whole opts for the Gold OA route, the cost to be paid by Swiss authors per Gold OA article is likely to change. If the share of Gold OA increases globally, the share of conventional articles as part of consumed research will decrease. If fewer subscriptions are required, Switzerland will have to pay less for conventional articles (assuming publishers maintain their prices).

Literature review

In the introduction, we noted that one driver of this analysis was a MPDL 2015 study on the costs of moving to OA. We have conducted a literature review to help us have a broader evidence base and understand how authors have undertaken similar analysis in different countries to inform our methodology. The full literature review is provided in Annex F.

3.2. Phase 2a: Shortlisting of OA restructuring models

As outlined in the introduction, OA can be financed a variety of ways i.e. there is no single model for OA publishing. In this section, we explain the procedure used to obtain a shortlist of models that are relevant for the Swiss public funding. Our methodology was as follows:

[25] Max Planck Digital Library (2016) Analysis of the international journal publishing activities in Switzerland with special emphasis on Open Access Gold publishing.

- We established a long-list of OA models, categorising OA models based on different financing structures.
- We then established assessment criteria against which we analysed each model to obtain a shortlist for modelling purposes.

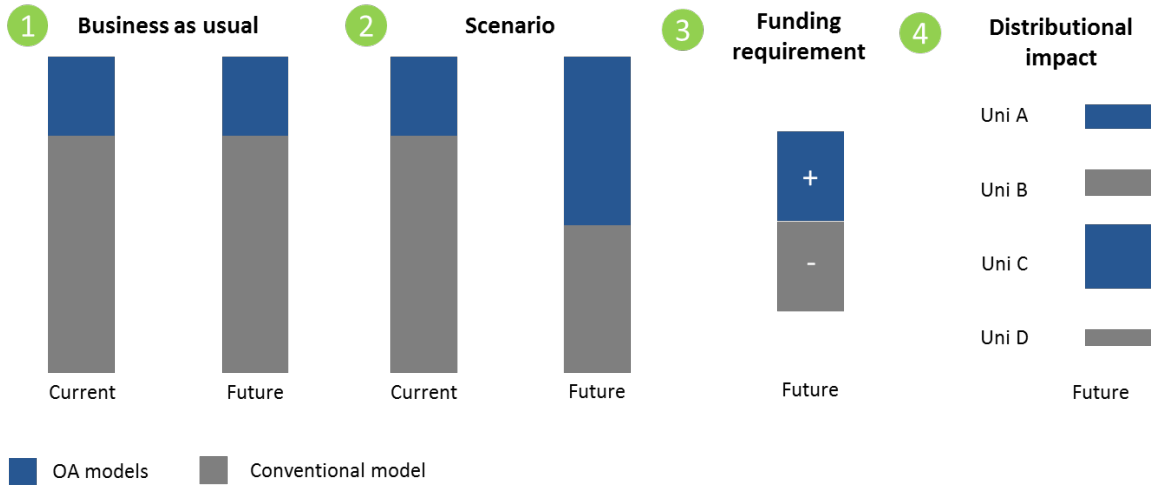
3.3. Phase 2b: Financial model

Funding requirements

As illustrated in Figure 3.1, the financial model is underpinned by five calculations:

- **Step 1**: We first establish a business-as-usual (BaU) scenario where the split between the different OA models is assumed to stay constant over time.
- **Step 2**: We create scenarios where each OA model is assumed to have a different split at a particular date; e.g. 50% Gold OA by 2024 or 80% Blue by 2020, etc.
- **Step 3**: We estimate the difference between the two scenarios. This gives the net financing requirement associated with each OA model.
- **Step 4**: We can then assess the funding requirement (and hence impact) on each individual library/university.
- **Step 5**: We add the cost of building infrastructure to support OA archiving. This step is not shown in the Figure 3.1, but explained in detail in Annex A.

Figure 3.1: High-level overview of the model structure



Source: CEPA

Uncertainty

An important part of this analysis is to understand how confident we can be with our findings. We try to provide a simple statistic on uncertainty, where a higher value means there is less certainty. The estimates for our ranges represent the difference between estimates derived from a bottom-up approach i.e. our primary data from questionnaires, and top-down data i.e. national level statistics from other sources.

Distributional analysis

Alongside the total funding consideration, an additional objective of this project was to identify and hence help mitigate impacts of the transition to OA on Swiss stakeholders; i.e. universities and libraries. Using data collected from these two types of institutions, we identify those most at risk during the transition.

3.4. Phase 3: Recommendation and implementation

The financial modelling supports the development of a recommendation. The cost is not the only consideration, but is obviously central to any discussion. An approach that is budget neutral is likely to be more feasible than an approach that requires additional funds.

4. SELECTION OF OA MODELS

4.1. Longlist of models

From the literature on OA models and survey gathered from Swiss institutions, we identified five different types of funding models for OA publishing. These are:

- **Gold OA**: Under this model, the OA publication is financed by authors[26] paying APC to OA publishers (where charged).[27]
- **Yellow OA**: There is no payment involved with this form of publication (though there will be costs of infrastructure). The author deposits his work in a subject or institutional repository.
- **Blue OA**: Under this model, the OA publication is financed by readers paying subscription fee to traditional publishers until the end of an embargo.
- **Hybrid OA**: Like Gold OA, the publication is financed by authors paying APCs to traditional publishers. But because the publication falls into a subscription package, it is financed again, this time by readers, paying subscription fee to traditional publishers. This is the double dipping issue.
- **Hybrid OA and offset**: This model has the same financial arrangement as the hybrid OA level but the double dipping issue is mitigated by an offset. Offsetting is an arrangement taken with publishers to discount the articles already paid by APCs.

These are described in Table 4.1 below.

Table 4.1: Long list of OA funding models

Model	Payer	Payee	Payment
Gold OA	Producers (Authors)*	Full OA publisher	APC
Yellow OA	*Not applicable since Yellow OA involves archiving rather than publishing.*		
Blue OA	Consumers (Readers such as universities)	Non-full OA publisher	Subscription until embargo
Hybrid Gold OA	Producers (Authors) & Consumers (Readers)	Non-full OA publisher	APC + subscription
Hybrid Gold + offset	Producers (Authors)	Non-full OA publisher	Subscription + APC - offset

**Note: where charged*

[26] We refer here to the author-side paying as opposed to the reader-side. However, it is possible that the actual payment is made by a different party than the actual author of the paper; e.g. a sponsor.
[27] As noted previously, there is a Platinum OA model where no costs are charged to authors.

We ignored model variants with no direct relevance to the financing structure. For example, a Blue OA article may be assigned different usage rights (e.g. gratis or libre), but this has no direct impact on the structure or level of financing.

Note that Green OA is not mentioned as a specific type of OA model. This is because Green is an umbrella term for Yellow and Blue OA. As such Green OA is not a standalone OA financing model.

4.2. Assessment criteria

To determine whether we should model all of these options, we develop a set of assessment criteria. The assessment criteria will also be useful in developing our recommendations, as the financial impact will only be one aspect of a broader assessment.

We include a set of mandatory criteria that OA models have to pass in order to be included in any modelling of financial flows.

Table 4.2: Mandatory assessment criteria

Criteria	Relevance	Assessment
Acceptability	The new model has to be acceptable to the key Swiss stakeholders[28] if it is to be implemented.	Pass/fail
Model is OA	This work is about OA, so any model adopted would have to meet the definition of OA e.g. as defined in the Budapest OA initiative (BOAI).	Pass/fail
Quality	We would expect the scientific work financed under this model to be of decent publishing quality; e.g. post-print (peer-) reviewed version of the work.	Pass/fail

The financial impact/ value for money is just one part of our assessment. We use additional criteria for the purposes of an overall assessment (this is contained in Chapter 7 under our assessment). These criteria do not necessarily carry the same weights as one another.

Table 4.3: Additional assessment criteria

Criteria	Relevance
Meets the need of researchers	An ideal model would be in synergy with the need of researchers. For example, can the researchers provide open data alongside their articles? Does the model make it easy to publish books?
Facilitates established international partnerships	Switzerland's research involves a high degree of international partnership. It would be easier for

[28] Relevant stakeholders are identified as public funding institutions, research consuming and producing institutions.

	the chosen model to be in harmony with the model chosen by Switzerland's partners.
Degree of financial restructuring	Transition to the chosen model would be facilitated if it did not involve a complete reconfiguration of the financing flows.
Research impact of the model	Assuming the funders want to maximize the impact of their public money, they want to support the model that will increase peer recognition and the status of Switzerland (in principle recognized by the number of citations). Impact also includes whether Switzerland is viewed as a leader in the international community and in establishing a role for university presses.
Supported by traditional publishers	It would be easier to implement a model that has the support of the industry (though by definition there may be a conflict of interest).

4.3. Shortlisted models

In the subsections that follow, we assess each model in turn against the criteria listed in the previous section.

Mandatory criteria: Acceptability

We base our assessment of acceptability on answers to our qualitative questionnaire. While the percentages of authors required to publish OA are not especially high at present, this may reflect that OA policies are still being developed and as such we consider that both Gold and Green (Yellow and Blue) paths are acceptable under this criterion. The hybrid OA model fails to pass the acceptability test. This is chiefly due to the concern of 'double dipping'. This is where a publisher levies a charge on an author (i.e. APC) in a hybrid journal, but does not decrease the price of Swiss subscriptions proportionally the volume of hybrid OA contained in that journal. The outcome is that publishers receive higher revenues (from institutions paying more).

Table 4.4: Mandatory criteria - acceptability

Model	Assessment	Description
Gold OA	Pass	Several Swiss stakeholders encourage (11%) or even require (2%, i.e. SNSF) their authors to publish their work in Gold OA. This proportion appears to be increasing.
Yellow OA	Pass	Numerous Swiss stakeholders encourage (31%) or even require

		(18%) their authors to deposit their work in a repository.
Blue OA	Pass	This model is supported by the stakeholders.
Hybrid Gold OA	Fail	The SNSF (and other institutions) do not support this model due to concerns of double dipping.
Hybrid Gold + offset	Pass	The SNSF has expressed that offsetting is a possibility, with a hybrid model as a transitional arrangement.

Mandatory criteria: Model is OA

Hybrid OA does not strictly meet the definition of OA. However, this model may be used for transition to greater OA - as such we give this a conditional pass.

Table 4.5: Mandatory criteria - Open Access

Model	Assessment	Description
Gold OA	Pass	These models meet the definition.
Yellow OA	Pass	
Blue OA	Pass	This model meets the definition. But we note the key issue of holding of copyright and licensing conditions, all through or after embargo. So funders should have a policy and advice on these.
Hybrid Gold OA	Conditional Pass	The article may be OA, but the journal is not fully OA. The journal can be hidden behind a paywall, and the user or the library may have to pay a fee to gain access. In this model, only the articles for which the authors have covered APCs are available for free. This solution is far from the idea of free access and is the subject of criticism, and much debate on the nature of publishing in OA. Numerous authors value the traditional publishing route because of the prestige/reputation that a published article may have with a given publisher. Meanwhile data shows that despite the double dipping issue, the number of hybrid OA articles has increased in recent years. We therefore retain Hybrid OA
Hybrid Gold + offset	Conditional Pass	

(+offset) as a potential transitional model at this stage.

Mandatory criteria: Quality

Yellow OA fails to pass the quality criteria as it is not a publishing model but rather a way to deposit research work. Since the objective of this project is to redirect the flow of financing for scientific publishing, this model is not relevant and we would not be comparing like-with-like should we adopt such a model.

Table 4.6: Mandatory criteria - quality

Model	Assessment	Description
Gold OA	Pass	Involves review, but risks of predatory publisher exist (e.g. Beall's list)
Yellow OA	Fail	This model is not publishing by merely archiving. The pre-print version is not the published version.
Blue OA	Pass	Post-print versions are the published version.
Hybrid Gold OA	Pass	Potential issue with this model involves the holding of copyright and licensing conditions, all through or after embargo.
Hybrid Gold + offset	Pass	Potential issue with this model involves the holding of copyright and licensing conditions, all through or after embargo.

Assessment against mandatory criteria

The assessment criteria suggests that Gold OA, Blue OA and Hybrid Gold OA with offset are models worth considering for the quantitative analysis.

Table 4.7: Result of assessment criteria

Model	Acceptability	Relevance	Quality
Gold OA	✓	✓	✓
Yellow OA	✓	✓	×
Blue OA	✓	✓	✓
Hybrid Gold OA	×	✓	✓
Hybrid Gold & offset	✓	✓*	✓

**Conditional pass.*

This gives us three main forms of OA publishing to consider; two of which may be long-term solutions and another that would be used in a transitional phase only.

Although we are not modelling yellow OA in this analysis, this does not mean that it is not a relevant consideration for our recommendations. This form of OA can be implemented alongside our other models.

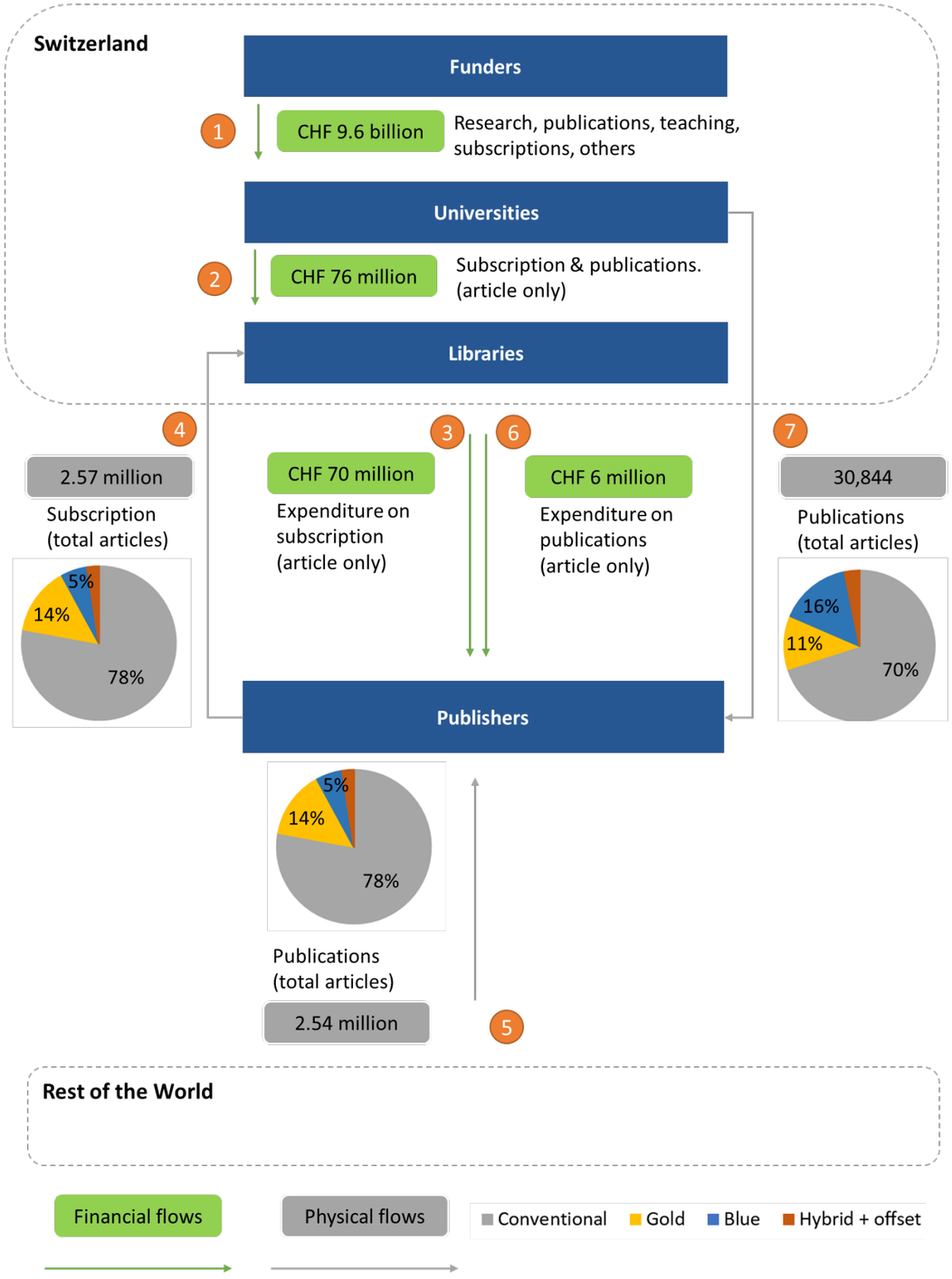
5. MAPPING OF CURRENT FLOWS IN SCIENTIFIC RESEARCH

To understand how OA publishing models will affect financial flows, we have to understand what the flows currently are. We consider the financial flows together with the associated physical flows; i.e. the research itself. Our financial flow modelling captures both the production and consumption of research.

5.1. Current financial flows in Swiss publishing

Figure 5.1 below shows a map of the financial flows within publishing in Switzerland and interactions with the rest of the World. On costs, we include direct costs in our mapping. There are also infrastructure costs that we discuss in our description. However, we do not have clear allocation rules on other indirect costs, so these are not included. For clarity, we only represent the flows underpinning article publishing and leave aside book flows.

Figure 5.1: Mapping of current flows for calendar year 2015



Source: CEPA

1 **Description**: CHF 9.6bn was provided by Swiss funders to universities for research, teaching, subscription and publication fees. Funders involve public funders (cantons, federal government, EU) and private funders.
Limitation: We were not communicated the detail of the funding sources. Moreover, only 18 institutions, out of a total of 57 Higher Education institutes, Universities of Applied Sciences, Universities of Teacher Education, Academies and Federal institutes responded. While the largest Swiss Universities all responded, this number is an underestimation of the total amount of funding towards research, publications, teaching and subscriptions.
***Source**: University data questionnaire. Total funding received.*

2 **Description**: CHF 76m flows from universities to libraries to pay for subscriptions and publication fees (for articles only). This is 0.8% of total research funding. There are CHF 2m in infrastructure costs not represented here (these are indirect costs).
Limitation: The CHF 76m is the amount reported by the libraries that responded to our questionnaire. 35 out of 58 libraries responded, including the largest libraries. Hence, the actual number is likely to be higher than the value quoted here. In addition, this value does not account for book subscription expenditure.
***Source**: Library data questionnaire. Total of subscription expenditure and publication expenditure.*

3 **Description**: A major of the expenditure on article publishing, CHF 70m, goes towards subscription fees from institutions to publishers to pay for academic journals.
Limitation: Same as #2
***Source**: Library data questionnaire. Total subscription expenditure.*

4 **Description**: In exchange, Switzerland gains access to the global production of articles. The split of global production involves Conventional (78%), Blue (5%) and Hybrid (2%) articles. Swiss institutions also have (open) access to the annual production of Gold (14%) articles and Blue articles (whose embargo period has expired). In total, we estimated that Swiss institutions have had access to over 2.57 million new articles produced in 2015.
Limitation: The reliability of the split may not perfectly reflect the current state of OA at the global level.
***Source**: Public statistics – see annex C.*

5 **Description**: The vast majority of articles (2.54 million) are produced by the rest of the world. Given the small contribution of Switzerland to this annual flow (0.03m), the split between publishing is very similar to the above when aggregating together.
Limitation: Same as #4.
***Source**: Public statistics – see annex C.*

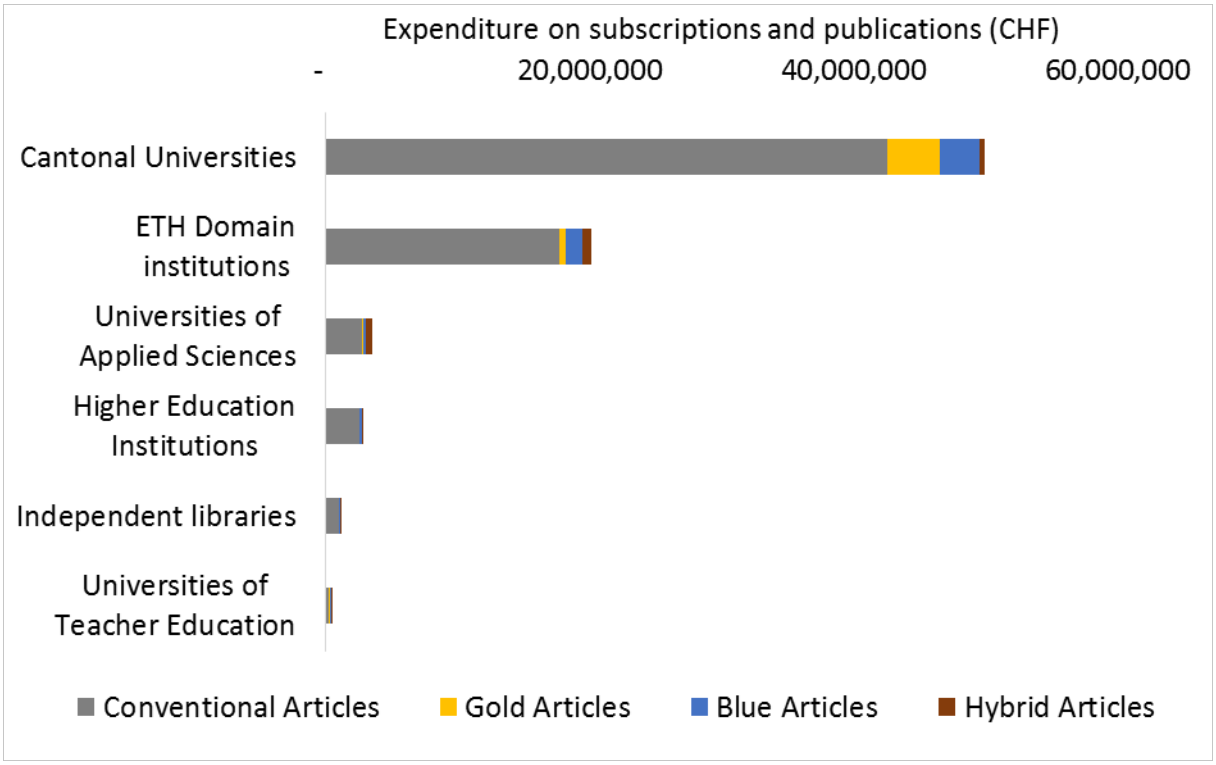
6 **Description:** Only CHF 6m goes towards publication costs, financing Gold and Hybrid articles; both of which incur Article Processing Charges (APCs). The other articles produced, Conventional and Blue, are not paid directly by Swiss libraries. Their cost is socialised and paid for with subscription fees from across institutions in Switzerland and the rest of the World.
Limitation: Same as #2.
***Source**: Library data questionnaire. Total publication expenditure.*

7 **Description**: Switzerland produces fewer conventional articles (70%), and a larger share of Gold (11%), Blue (16%) and Hybrid articles (3%) compared to the rest of the world.
Limitation: Same as #2
***Source**: Library data questionnaire. Total number of articles published.*

5.2. Financial map at the disaggregated level

Moreover, it is not just the total expenditure on publications and subscriptions that is relevant for the purposes of our analysis. There are also distributional effects resulting from decisions made on the OA models chosen. Where a certain choice creates 'winners' and 'losers', this will be a key consideration. In Switzerland, the top 10 institutions account for over 80% of expenditure. To give a view of the most impacted universities, we mapped out each library with its affiliated university. As shown in Figure 5.2, Cantonal Universities and the ETH Domain institutions are the largest producers and consumers of academic research in Switzerland. We also expect that they will be most impacted from a transition to OA.

Figure 5.2: Total expenditure on publications and subscriptions broken down by types of institutions



Source: CEPA

6. FUTURE FUNDING REQUIREMENTS AND DISTRIBUTIONAL IMPACTS

In this section, we present the results of the financial modelling. First, we set out the different options that were modelled. We then present the findings in terms of total funding requirement under different models and the distributional effects on Swiss universities and libraries. For each OA model considered, we investigate what is driving the funding impacts. Finally, we consider key uncertainties using scenario analysis.

6.1. Models

Based on the shortlisted models in Chapter 4 (namely Gold OA, Blue OA and a hybrid transition), we have simulated several transition paths towards a future OA state. We set out the key characteristics of these models below.

Figure 6.1 provides a graphical illustration for each of the models simulated. The key take-away is that no matter what model Switzerland adopts, it has a limited direct impact on options chosen for production. This is because roughly 98.8% of the research consumed in Switzerland is produced abroad.

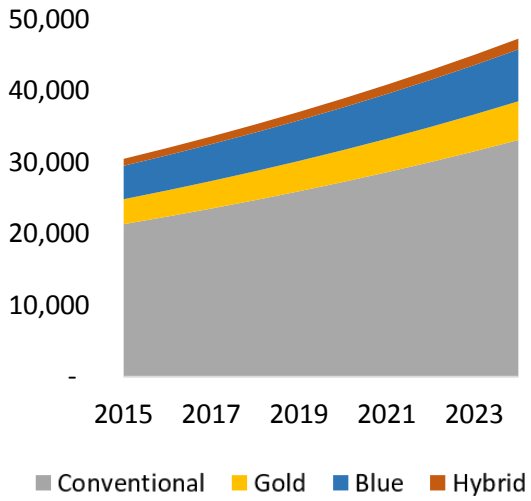
Figure 6.1: Modelled article production and consumption for transition models. (The vertical axis on the graphs below are articles numbers).

Business as Usual (BaU)

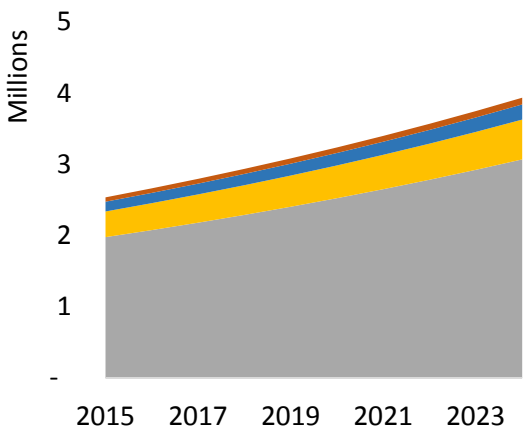
First, we model a BaU transition path. Under this path the total volume of articles being produced (left) and consumed (right) increases at the current global growth rate of c.5% (see Annex A for data sources and assumptions). The split between the four OA models stays the same (i.e. the proportion of articles through different publication models) – as indicated in Chapter 5.

For all the transition paths modelled below, under our base case assumptions, we use the same overall production growth rate (5%). However, we alter the split (or distribution) between OA models, such that the share of Gold OA and Blue OA changes relative to the BaU model.

Production *(number of articles)*



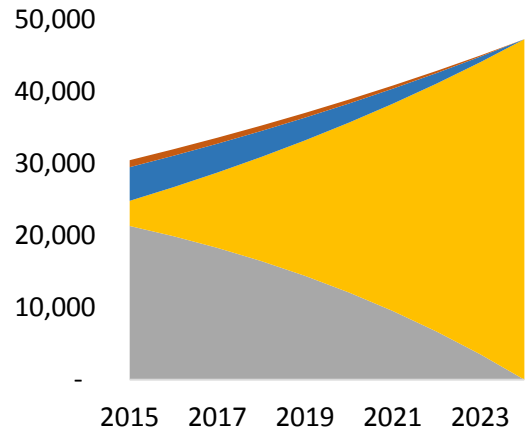
Consumption *(number of articles)*



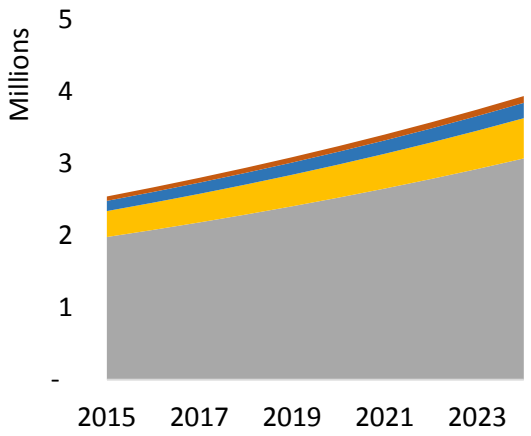
Gold

Under a Gold transition path, Gold OA articles being produced in Switzerland account for 100% of the total production by 2024 (i.e. Swiss publishing is fully gold OA in production by 2024). The consumption of articles is impacted by this shift, but because Swiss article production represents a small amount of its own article consumption, this impact is minimal.

Production *(number of articles)*



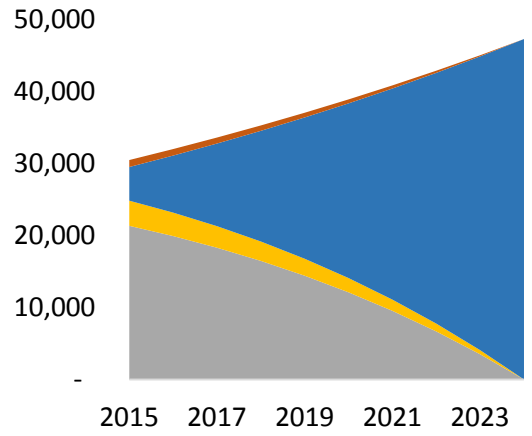
Consumption *(number of articles)*



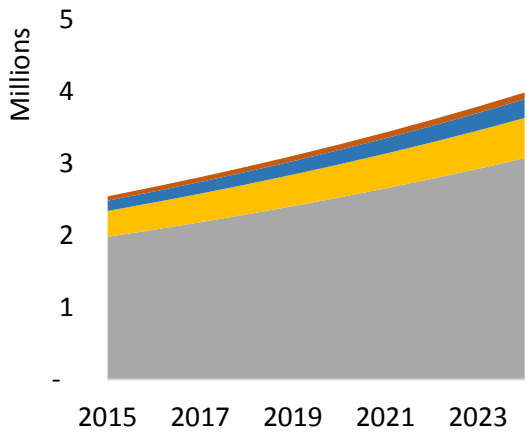
Blue

The concept is the same as with Gold; Blue OA article production reaches 100% by 2024.

Production *(number of articles)*



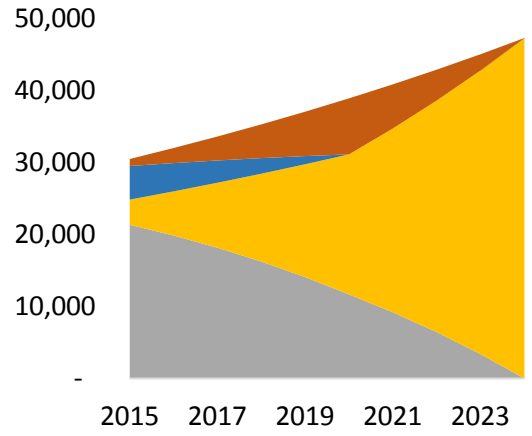
Consumption *(number of articles)*



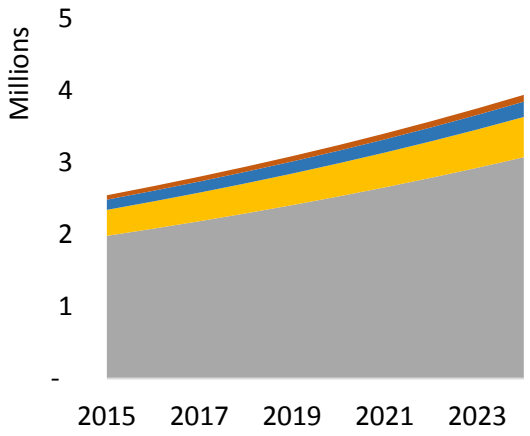
Gold + Hybrid

For this transition path, we projected Swiss Gold OA production to reach 100% of the total production in 2024. We modelled hybrid Gold OA + offset to play a transitional role. Production through a hybrid model reaches 20% of the total Swiss production in 2020.

Production *(number of articles)*



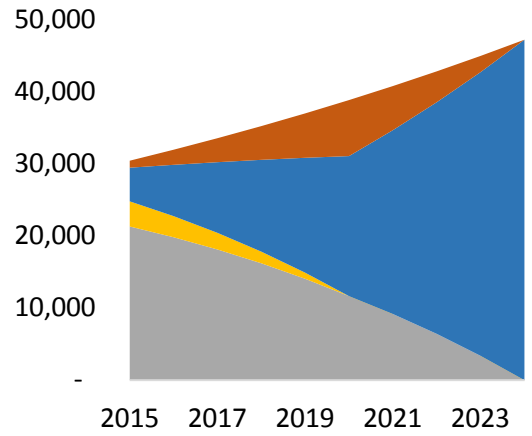
Consumption *(number of articles)*



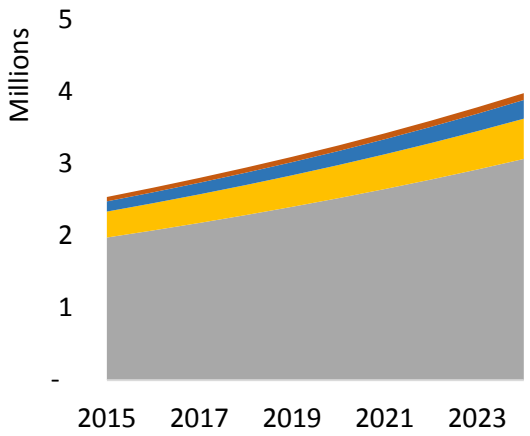
Blue + hybrid

Similar concept as Gold + hybrid: 20% hybrid in 2020, falling away as 100% Blue OA production is achieved by 2024.

Production *(number of articles)*



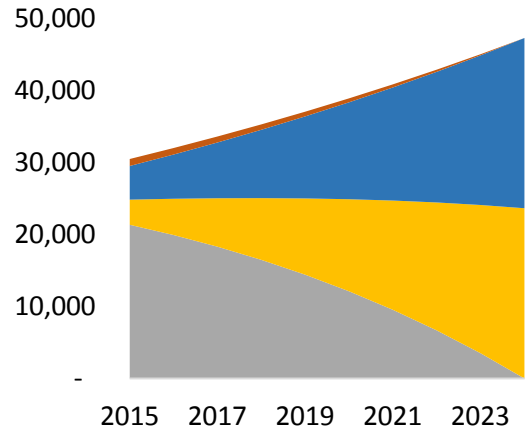
Consumption *(number of articles)*



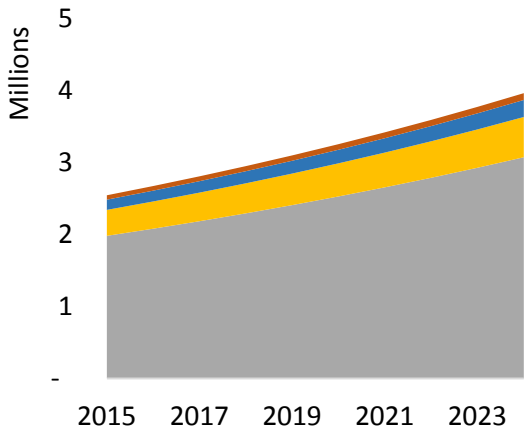
Mixed

We modelled Blue and Gold OA production to play an equal role in the transition. Blue and gold both account for 50% of the total article production by 2024 in Switzerland. Here again, the consumption of articles is only marginally impacted.

Production *(number of articles)*



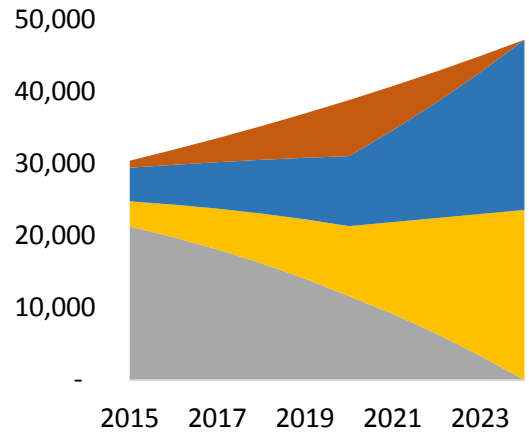
Consumption *(number of articles)*



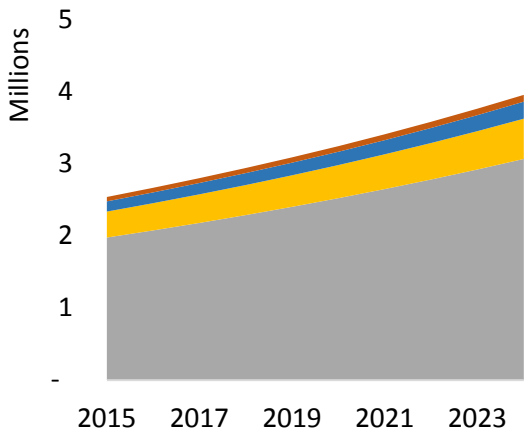
Mixed + hybrid

This transition path allows for hybrid gold OA to play a transitional role (20% by 2020) while Blue and Gold OA each account for half of total Swiss production by 2024.

Production *(number of articles)*



Consumption *(number of articles)*



6.2. Findings

We discuss in turn our findings for each model in terms of total funding requirements and distributional analysis. Unless mentioned explicitly, the results detailed below are for articles only. We have not included books due to issues with the quality of data (see Annex G for more information). In short, the robustness of the data on books has not been crossed-checked due to the lack of public statistics on the subject.

Funding impacts

Our baseline scenario and baseline sensitivity[29] shows that the most cost effective model for Switzerland in the 2015-24 period would be to adopt the Blue OA model. It is estimated that this model will deliver a saving of around CHF 2 million annually, relative to the baseline funding scenario. This represents a saving of around 2% of the total publishing budget of Swiss institutions. In contrast, the most expensive model to take up is expected to be the Gold + hybrid model. Hybrid is more expensive as a transitional step for each model. It is estimated that the Gold + hybrid transitional model would increase the baseline funding requirement by CHF 30 million annually, equivalent to 30% of baseline funding.

Table 6.1 gives the funding impact for our baseline case for the different models. It details:

- **The total impact of funding**: the net difference between the BaU case and transitional model between now and 2024.
- **The annualised impact**: the total funding impact divided by the number of years until transition (for 2015-24, this is ten years).
- **Total impact expressed in % of the baseline publication funding:** publication funding represents the library budget for article publication (production) and subscription expenditure (consumption).
- **Total impact expressed in % of current research funding:** total research funding includes the income of universities; i.e. teaching, research, publication, and any other expenditure.

We find that the impact of moving to OA, depending on the model adopted, can range between a saving of CHF 2 million per year up to 2024 to an increase in cost of CHF 30 million annually.

[29] We use our central estimates throughout the findings unless indicated otherwise.

Table 6.1: Funding requirement for the baseline scenario and reference sensitivity, articles 2015-24

OA model	Total impact (CHF million)	Annual impact (CHF million)	Total impact (% publication funding)	Total impact (% research funding)
Blue	-20	-2	-2.0	-0.02
Blue + hybrid	24	2	2.4	0.02
Mixed Gold & Blue	125	13	12.4	0.13
Mixed Gold & Blue + hybrid	162	16	16.1	0.17
Gold	271	27	26.8	0.28
Gold + hybrid	301	30	29.8	0.31

Uncertainty

As detailed in Chapter 5, the results are a function of the inputs and assumptions made. While we have gathered a range of information from institutions, this is not complete for all institutions and there is a degree of uncertainty around some of our input assumptions e.g. number of article produced.

Quantifying this uncertainty allows us to focus not only a central estimate, but a range of estimates. This is critical for sound decision-making as it shows that the outcome is a function of circumstances and forecasting is not a science.

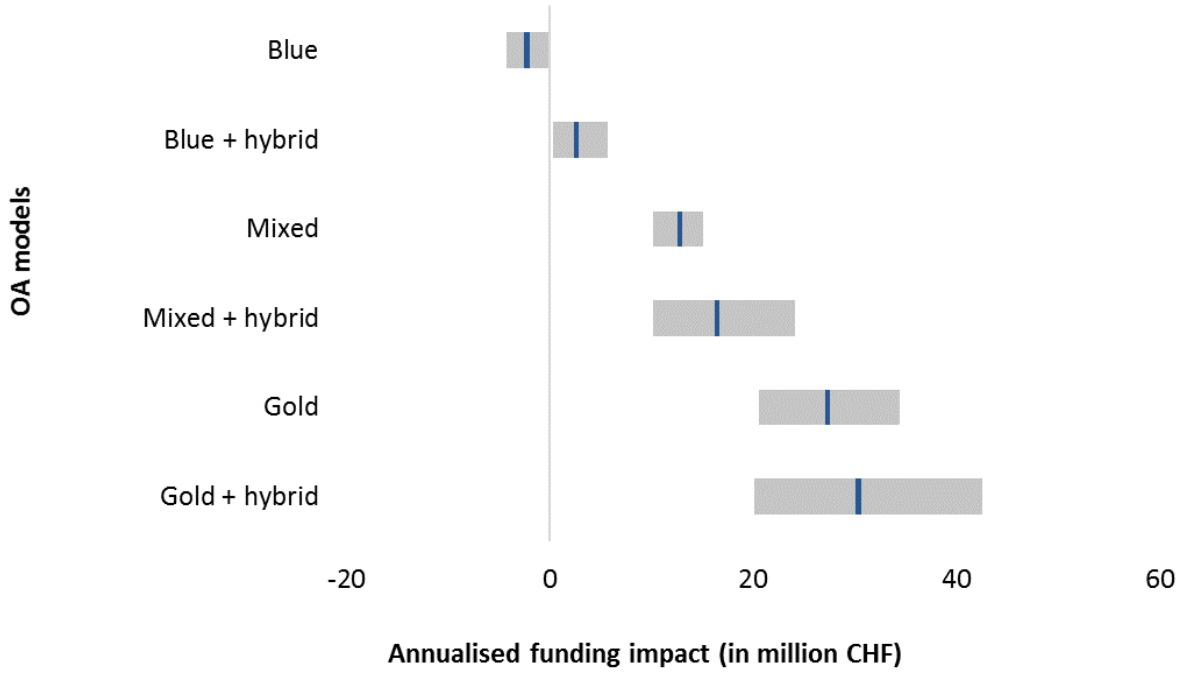
We used a range of inputs and assumptions where we had reasons to believe that the data may contain errors, missing observations or cross-checks indicated that the information was likely to be an over- or under-estimate. For example, we know that the libraries data we collected did not include all Swiss libraries, therefore the total number of articles may be under-estimated (though was likely to represent a critical mass).

As an example of our approach, library data from our questionnaire indicated that Switzerland produced 2,716 Gold OA articles in 2015. Estimates using public statistics indicates that Switzerland produced around 4,263. Our central estimate was 3,490, the average point between the two, 2,716 for a “low volume” uncertainty scenario and 4,263 for a “high volume” uncertainty scenario.

Figure 6.2 shows the total annualised impact per model. The blue point is the central case; e.g. using the average number of articles, prices and other central assumptions. Around these, the grey shaded areas show the range of estimates.

The results below seem to indicate that the gold and hybrid models have a greater degree of uncertainty. However, expressed in percentage terms, we find that all models yield comparable levels of uncertainty – around 50% above and below the central estimate. We present these in the order of lowest to highest cost in Figure 6.2.

Figure 6.2: Total annualised impact per models and uncertainty ranges for articles only (in million CHF)



Source: CEPA

Distributional impacts

In terms of impact on individual libraries, data shows that institutions are expected to experience a decrease in their expenditure of CHF 60,000 p.a. on average under the Blue model and an increase up to CHF 960,000 p.a. under the Gold + hybrid model. This is summarized in Table 6.2.

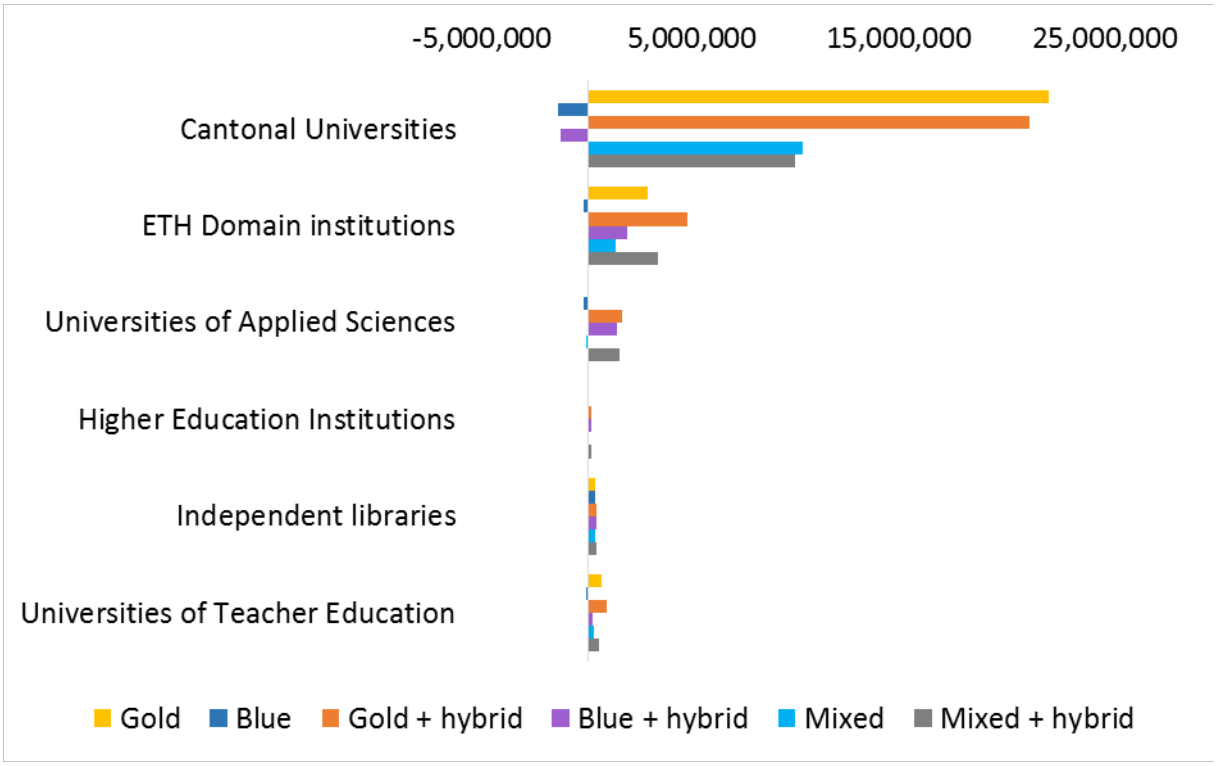
Table 6.2: Impact on institutions – distributional cost impacts on Swiss institutions

Row Labels	Average annual impact (CHF million)	Average total impact (% publication funding)	Max annual impact (CHF million)
Blue	-0.06	-0.05	0.52
Blue + hybrid	0.08	0.07	1.35
Mixed	0.40	0.16	6.40
Mixed + hybrid	0.52	0.26	5.65
Gold	0.86	0.36	13.99
Gold + hybrid	0.96	0.46	12.88

In the Gold scenario, approximately 12 of the 35 institutions for whom we have financial data with data would be affected by 20% of more.

Figure 6.3 shows the total impact by types of institutions. The impact is relatively the same as the distribution of current flows. Cantonal Universities would bear the largest chunk of the cost and the benefits of any model choice followed by the ETH institutions.

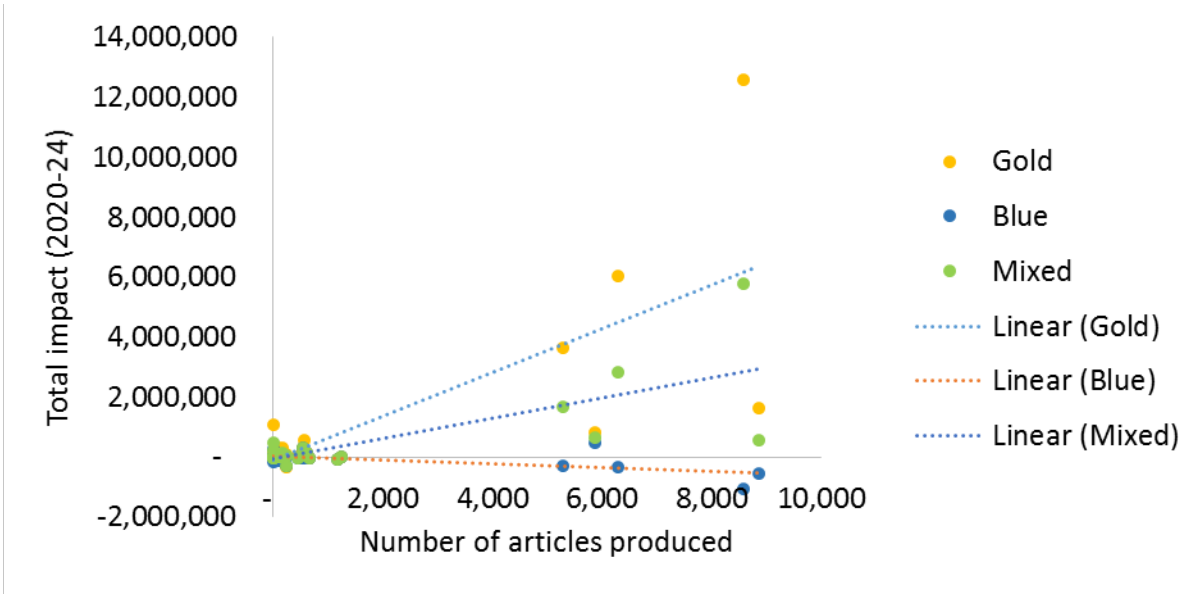
Figure 6.3: Total impact by types of institutions across models accounting (in CHF)



Source: CEPA

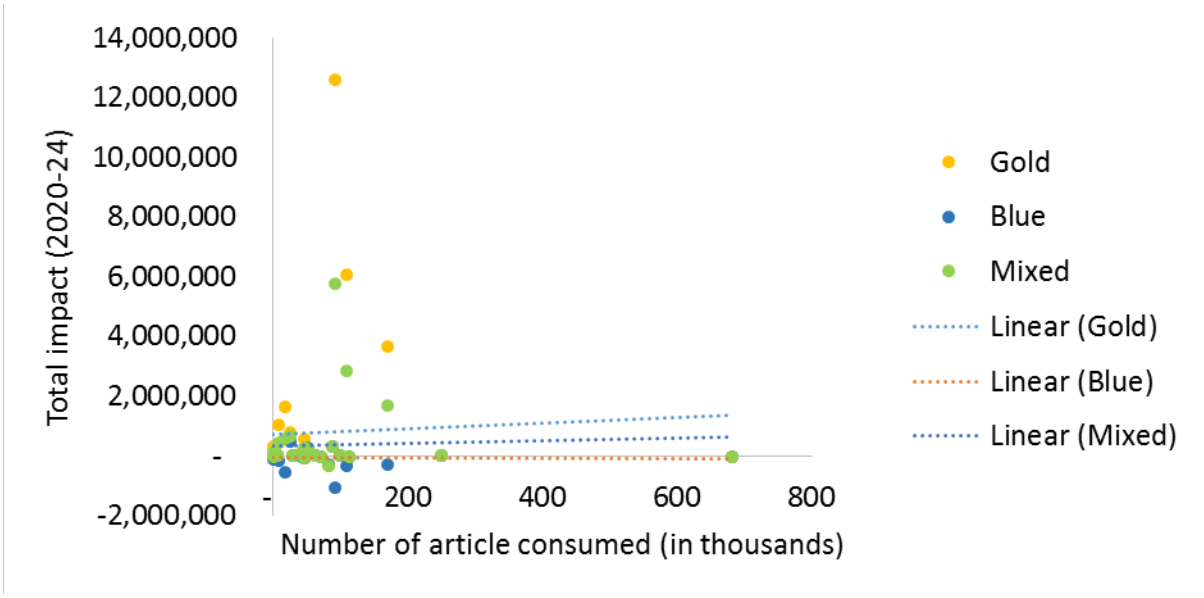
Finally, we want to draw attention to the correlation between the impact of OA models and whether an institution is a research consuming (research intensive) one or a research producing one (teaching intensive). Figure 6.4 shows the correlation between the number of articles ***produced*** by each institutions (symbolised by the dots) and their total impact across models. While Figure 6.5 shows the correlation between the numbers of articles ***subscribed (or consumed)*** by each institutions and the net impact. The result demonstrates that there is a strong positive correlation between article production and the impact of Gold OA, while there is a small negative correlation between article production and the impact of Blue OA.

Figure 6.4: Correlation between the article production and financial impact across models (CHF m p.a.)



Source: CEPA

Figure 6.5: Correlation between the article consumption and impact across models



Source: CEPA

6.3. What is driving the results

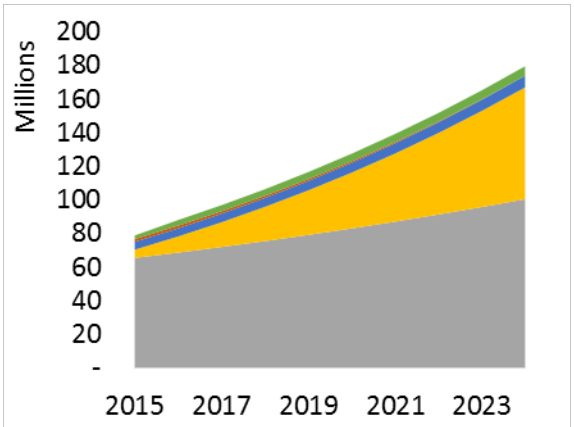
This section examines the key drivers underpinning funding impact estimates. Figure 6.6 shows the funding requirement in each OA model.

Figure 6.6: Determinants of funding requirement by model – central scenario. (all values below are in CHF)

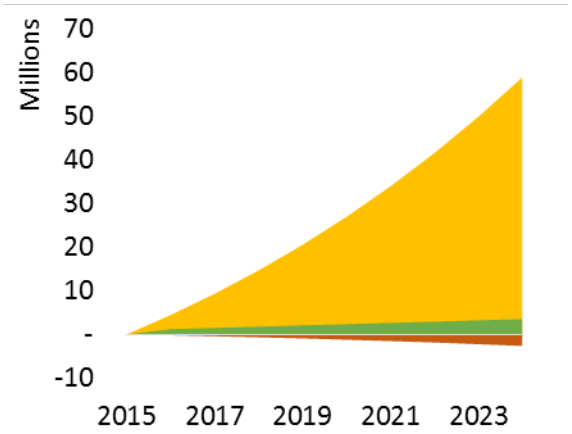
Gold

The funding impact on Gold OA is primarily driven by the rise in APC expenditure not being offset by savings on conventional publications. Switzerland does not make savings elsewhere since it keeps paying a large amount for its conventional journals (left figure).

Total funding requirement *(CHF)*



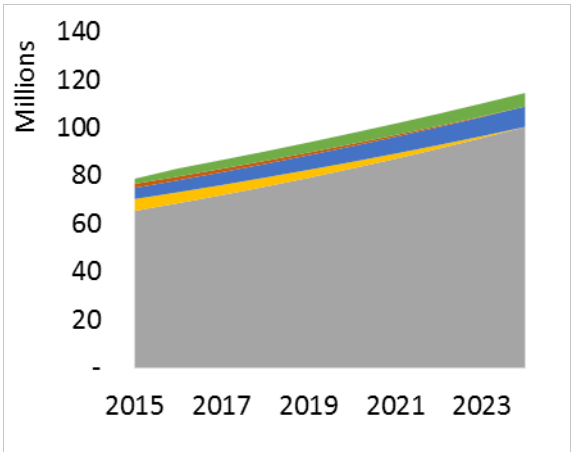
Net funding requirement *(CHF)*



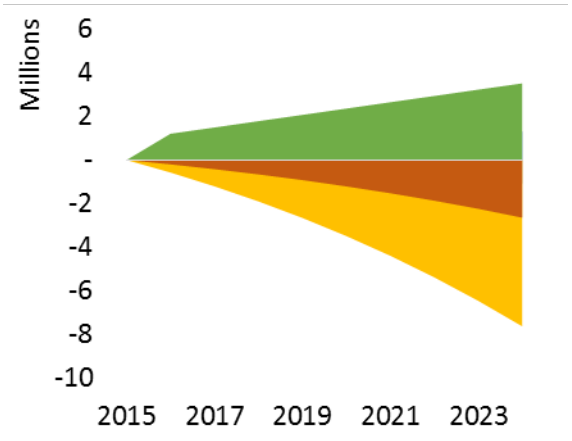
Blue

Blue articles are priced at the consumption-level – it is a reader-pays model. Therefore the cost increase in Swiss Blue article is spread across institutions and readers across the world (through subscription fees mainly). Switzerland's spending on Blue articles increases by a small amount (right figure). Infrastructure costs increase with the rising share of Blue. This cost increase is again small. Overall, the model incurs savings since it decreases the expenditure on Gold and hybrid OA.

Total funding requirement *(CHF)*



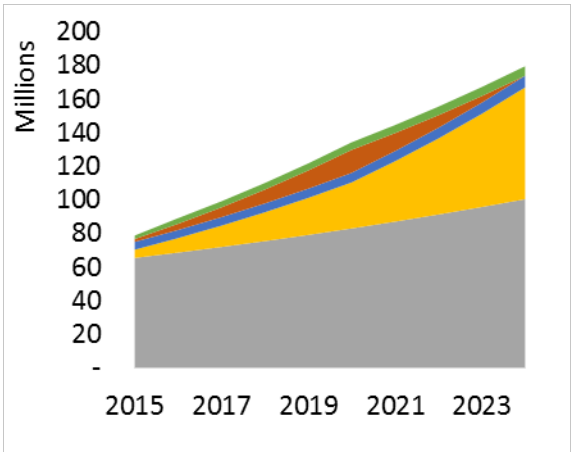
Net funding requirement *(CHF)*



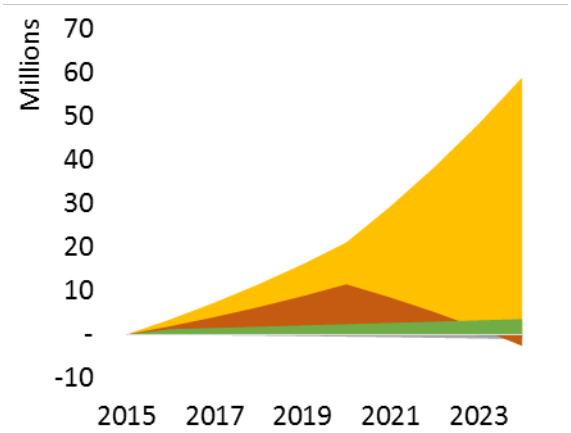
Gold + hybrid

Gold and hybrid is more costly since the production of hybrid rises and the APC associated with the hybrid articles is relatively expensive. Limited savings are made from the offset given that the offset reduces the cost of subscription by a small fraction but leaves untouched the cost of producing a hybrid OA article.

Total funding requirement *(CHF)*



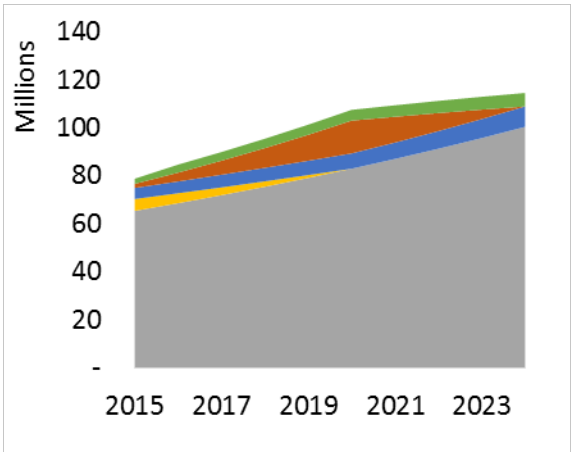
Net funding requirement *(CHF)*



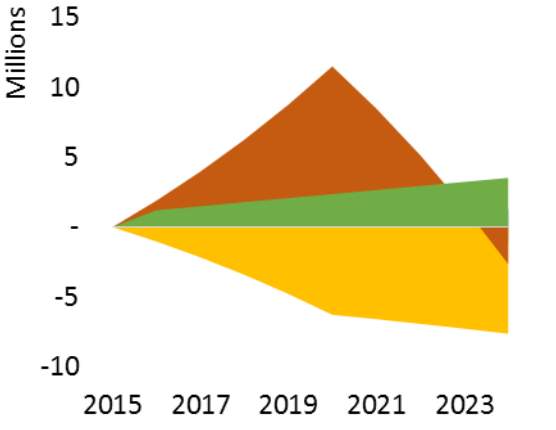
Blue + hybrid

Blue and hybrid is more costly since the production of hybrid rises and the APC associated with the hybrid articles is relatively expensive. Under this model, Switzerland makes almost no savings on its conventional consumption – the main driver of cost.

Total funding requirement *(CHF)*



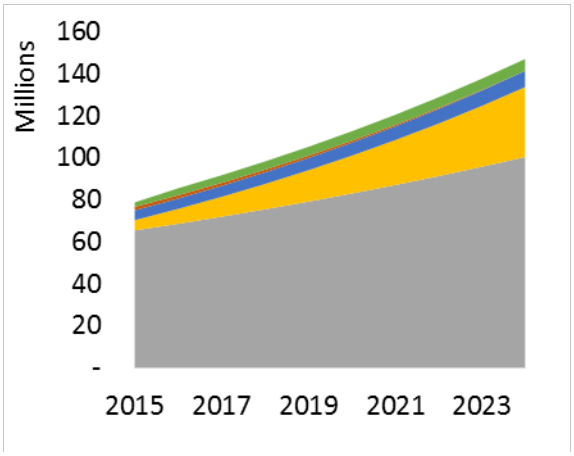
Net funding requirement *(CHF)*



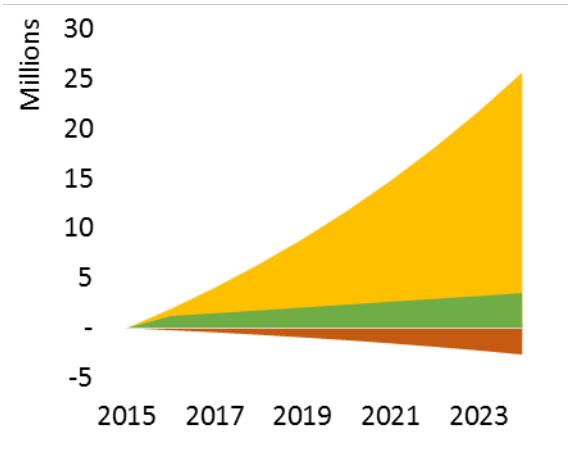
Mixed

Funding for Gold OA far outweighs that for Blue OA. As above, APC is the main driver.

Total funding requirement *(CHF)*



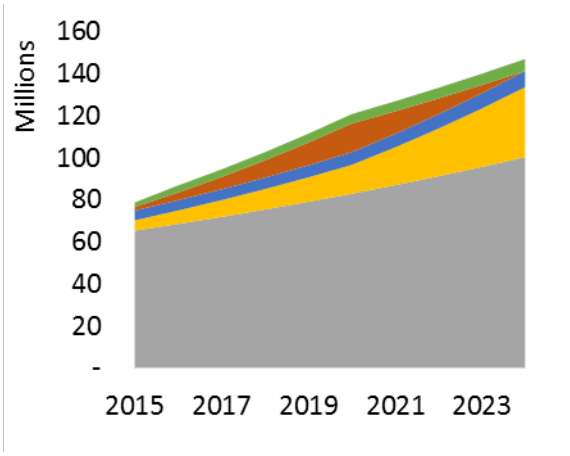
Net funding requirement *(CHF)*



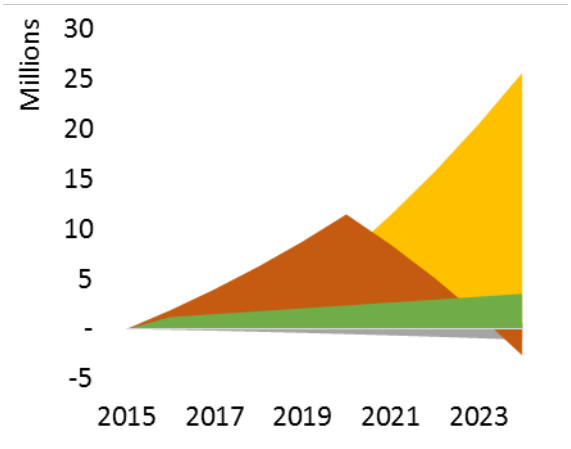
Mixed + hybrid

Funding for Gold OA far outweighs that for Blue OA and hybrid transition further pushes the cost up. As above, APC (for gold and hybrid gold) is the main driver.

Total funding requirement *(CHF)*



Net funding requirement *(CHF)*



6.4. Sensitivities and scenarios

Assumptions are required regarding the production volumes going forward or the prices of each model as well as the strategic choices of other producing countries and the pricing decisions of publishers. These assumptions are summarized in Table 6.3 below (the baseline scenario row).

These parameter values and assumptions may turn out to be poor predictors. Sensitivity analysis can be used to investigate the potential differences in funding impact if we change the values of our input assumptions.

In the scenarios described in Table 6.3 and Table 6.4, we illustrate the impact of making changes to the model described as our baseline case. We then examine the individual impact of each of those parameters on the cost of transition for each model.

Table 6.3: Assumptions across scenarios

Assumption	Baseline	APC prices increase	Sub. prices increase	World goes Blue	World goes Gold (slow)	World goes Gold (fast)	Double dipping	Embargo period increases	Fast track transition
APC prices are constant over time.	✓	✗	✓	✓	✓	✓	✓	✓	✓
Subscription prices are constant over time.	✓	✓	✗	✓	✓	✓	✓	✓	✓
Global production split remains constant.	✓	✓	✓	✗	✗	✗	✓	✓	✓
Hybrid articles are fully offset.	✓	✓	✓	✓	✓	✓	✗	✓	✓
Embargo period is one year.	✓	✓	✓	✓	✓	✓	✓	✗	✓
Full transition by 2024. Bridge transition in 2020.	✓	✓	✓	✓	✓	✓	✓	✓	✗
Modelling is done in real terms.	✓	✓	✓	✓	✓	✓	✓	✓	✓
Libraries have 100% back access to historical content.	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 6.4: Detailed assumptions across scenarios

Scenario	Description / assumptions
APC prices increase	Same as baseline (CHF 1,409) but we have assumed that the price of an APC could match that of hybrid APC (CHF 1,755). This is an increase by 24%. The rationale being that as Gold OA becomes mainstream, APC price increases in order to match the quality and reputation of established hybrid OA journals.
Subscription prices increase	Same as baseline (CHF 33) but subscription prices increase over time to account for the change in volume (CHF 35). This is an increase by 5%[30]. We do not think that prices will surge because the subscription price is a global price and as such is more likely to be influenced by global production level rather than Swiss production level.
World goes Blue	Same as baseline but the rest of the World makes a transition to Blue OA access (50%).
World goes Gold (at current trend)	The rest of the World keep producing Gold OA articles at the current rate (16% increase annually) reaching 35% gold by 2024.
World goes Gold (fast)	Same as baseline but the rest of the World makes a fast transition to Gold OA access (50%).
Double dipping	Same as baseline but Swiss academic institutions do not manage to negotiate an offsetting arrangement with publishers. Offset = 0%.
Embargo period increases	Same as baseline but publisher increase the length of the embargo period on Blue articles from one year to two years.
Fast track transition	Same as baseline but Switzerland makes a transition to full OA by 2020. We do not consider other transitional steps.

The scenario analysis provides useful insights. Table 6.5 further below shows the total annualised impact for each model across scenarios. Table 6.6: Total additional annualised impact for each model across scenarios relative to baseline (in million CHF) displays the total additional annualised impact, equal to the net impact for each model relative to baseline.

[30] This 5% annual increase in price is modelled for the same volume, so actually we are including more than 5% cost increases due to the modelled increase in volume.

Table 6.5: Total annualised impact for each model across scenarios (in million CHF)

Scenarios	Gold	Blue	Gold + hybrid	Blue + hybrid	Mixed	Mixed + hybrid
Baseline	27	-2	30	2	13	16
APC prices increase	33	-2	35	2	15	19
Subscription prices increase	29	0	33	5	15	19
World goes Blue	27	-2	30	2	12	16
World goes Gold (at current trend)	15	-14	18	-10	1	4
World goes Gold (fast)	6	-23	9	-19	-8	-5
Double dipping	27	-2	30	2	13	16
Embargo period increases	33	4	36	8	18	22
Fast track transition	36	-4	36	-4	16	16

Table 6.6: Total additional annualised impact for each model across scenarios relative to baseline (in million CHF)

Scenarios	Gold	Blue	Gold + hybrid	Blue + hybrid	Mixed	Mixed + hybrid
APC prices increase	6	0	5	0	2	3
Subscription prices increase	2	2	3	3	2	3
World goes Blue	0	0	0	0	-1	0
World goes Gold (at current trend)	-12	-12	-12	-12	-12	-12
World goes Gold (fast)	-21	-21	-21	-21	-21	-21
Double dipping	0	0	0	0	0	0
Embargo period increases	6	6	6	6	5	6
Fast track transition	9	-2	6	-6	3	0

We detail below the key implications:

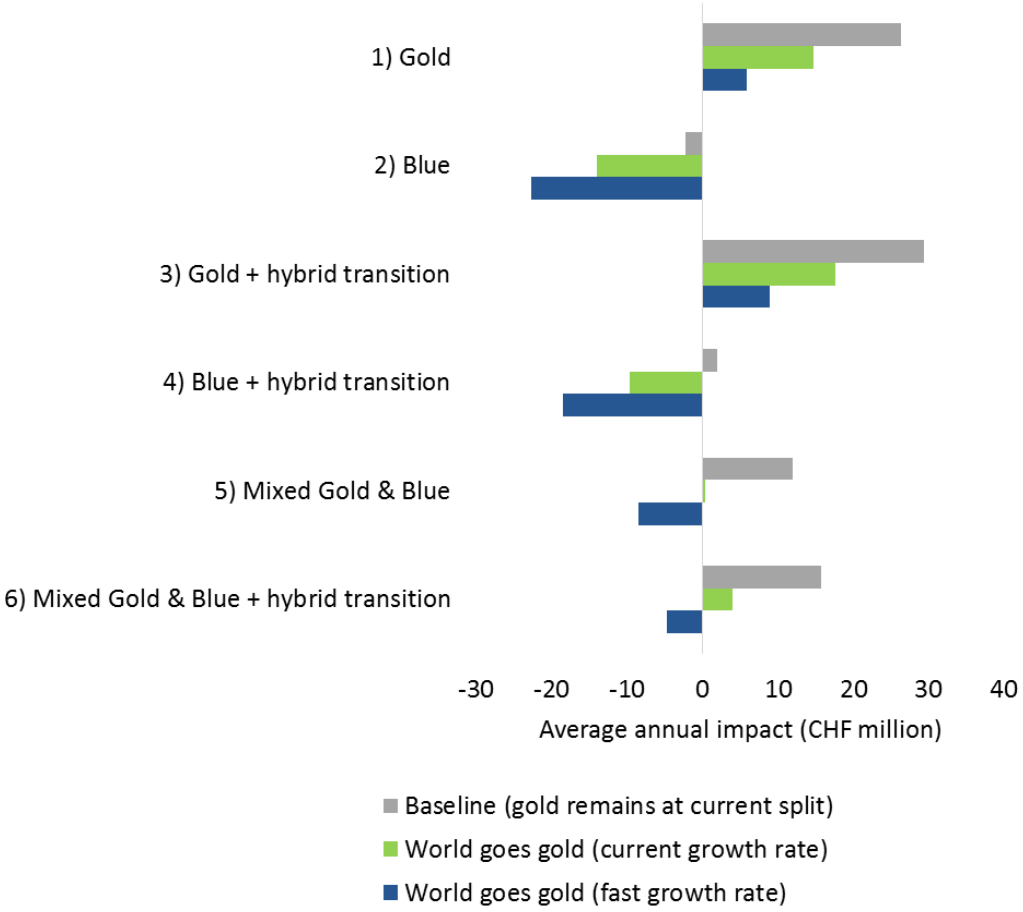
- **The actions taken by the rest of the world in terms of Gold OA is the single most significant impact for Swiss funding.** As shown in Figure 6.7 below, we modelled scenarios where the rest of the world adopted the Gold OA model to different extents.
    - Assuming that the share of gold OA stays at its current level (the grey scenario in Figure 6.7),[31] Switzerland will incur large transition costs for Gold OA or Hybrid OA. This is because Swiss expenditure on subscriptions for conventional article remains largely unchanged, as the rest of the world does not transition towards Gold OA.
    - If the rest of the world makes a transition to Gold OA, maintaining the current growth rate of Gold OA (green scenario in Figure 6.7)[32], Switzerland benefits from an estimated CHF 12 million saving from reduced conventional article expenditure.
    - If the rest of the world makes a transition to Gold OA, whereby a majority[33] of the global article production is comprised of Gold OA articles (green scenario in Figure 6.7), a further CHF 8 million could be saved.

[31] Current level at 14%

[32] Gold OA has increased by 16% annually over the period 2004-2009. Using this growth rate, gold OA reaches 35% of global output by 2024.

[33] We have assumed that 50% of the global gold production reaches 50% in 2024. This number is arbitrary but we estimate that it would be coherent assuming that a consortium of producing countries coordinate to make a transition to Gold OA.

Figure 6.7: Impact of global decision on Swiss funding requirement



Source: CEPA

- **What other countries do in terms of Blue OA does not yield the same impact as the world moving to Gold.** An article produced under a Gold OA model is taken outside of the conventional publishing package. Therefore, it becomes a public good. In contrast, the cost of Blue OA articles are socialised amongst all readers globally until expiration of the embargo period. It only becomes a public good after the embargo period.
- **The risk of APC and subscription price increases will make the transition for each of the models more difficult.** There is uncertainty on both the level of an APC and the cost of subscriptions. We cannot ascertain which models are more at risk of price increases.
- **Offsetting has a limited impact.** Whether Swiss institutions manage to secure an offsetting arrangement with publishers will have limited impact. The main determinant of the cost of hybrid OA model is the APC that is incurred at the production of an article. However, an offset allows to discount the fees incurred at the consumption of this article. The APC of a hybrid OA is roughly CHF 1,755. But the subscription cost paid per conventional article is estimated to be around CHF 33. An offset applied on the latter has limited impact.
- **Embargo length has an impact, but the impact is similar across our models.** If the average embargo period is one year, Switzerland will pay for the number of articles produced in that year. If the embargo period is extended to two years, the number of articles requiring access through subscription packages will double (if volumes are constant). However, this will not

affect models with a large share of Blue OA more necessarily. This is because, in any given year, Switzerland pays for the Blue OA it produces and those that are produced by the rest of the world through its subscription expenditure. Since the Swiss share of global production is small, the choice of model and length of embargo shows little correlation. There would be a significant impact if the world went forward with the Blue OA model, while publishers responded by increasing the length of the embargo period.

- **The speed of transition increases the cost of models with a large share of Gold OA but decreases it for models with a large share of Blue OA**. The reason is straightforward. Gold/hybrid-intensive models incur costs more quickly, while Blue-intensive models reduce costs and so faster transition leads to greater savings.

6.5. Conclusion

If we assume no change outside of Switzerland, producer-pay OA models (i.e. Gold and hybrid) incur higher costs. In contrast, consumer-pay OA models (i.e. Blue) can be less expensive than current costs if they can be implemented.

Distributional impact analysis shows that some Swiss academic institutions will be affected more than others, as expected. Article-producing institutions will end up paying more.

Switzerland represents a small proportion of global output (1.2%) and unless the world chooses to go OA, a large proportion of funding will still go to paying for conventional subscriptions. Hence, if Switzerland can encourage other countries to move to OA (most likely through setting an example and through international partnerships), this has the potential to significantly reduce costs.

7. RECOMMENDATIONS

7.1. Introduction

As noted previously, the financial impact is not the only consideration in developing recommendations for a publishing model to be assumed in Switzerland. In our models, we included a hybrid approach as part of a transition, however this scored less favourably with our mandatory assessment criteria and our modelling indicated that this leads to higher costs. As such, we do not model a hybrid approach and narrow our choice down to Gold OA and Blue OA.

We look at the additional criteria set out in Chapter 4.2 to provide a recommendation. These include:

- Meeting the need of researchers;
- Facilitating international partnerships;
- Degree of financial restructuring;
- Publishing impact; and
- Support from traditional publishers.

We consider each of these in turn.

7.2. Assessment of models

Additional criteria: Meeting the need of researchers

A Gold OA model has limited synergies with book publishing and less so with open data (though the newest OA journals offer the possibility of OA data). However, as new models are developed and momentum continues with Gold OA, there may be greater synergies in future.

A Blue OA model can meet the need of researchers, but the shorter the embargo period, the better the model scores in terms of meeting the needs of researchers. We would expect that the article is made freely available after this embargo period (or through a set process). For encouraging researchers, the universities must implement smooth workflows.

There are further issues relating to publishing impact that we discuss later within this section.

Additional criteria: Facilitates established international partnerships

A Gold OA model has synergies with the model used in the UK and the Netherlands, however these partnerships represent only 7% of all partnerships for Swiss authors.

A Blue OA model has greater synergies with Switzerland's main research partners (USA, Italy, Germany and France), though noting that within these countries certain sectors may adopt different OA models rather than be completely homogenous.

Additional criteria: Degree of financial restructuring

Gold OA involves switching from a reader-pays subscription model of subscriptions to an author-pays system. However, Switzerland already has approximately a third of publications being delivered through an OA route and so there are likely to be financial paths in place.

Blue OA would retain a reader-pay model. However, simplicity is not paramount and other countries have made a transition to a gold OA focus.

Additional criteria: Publishing impact

Research Impact

A number of studies discuss the impact of Gold OA. There are a number of OA journals with high impact factors and others with low impact factors (for example, see the Eigenfactor index), however there appears to be increasing influence from Gold OA journals as the share in Gold OA increases.

According to Laakso & Bjork (2012) delayed OA journals have on average twice as high average citation rates compared to closed subscription journals and three times as high as immediate OA journals. Blue OA may therefore score well in terms of publishing impact from this perspective.

International leadership

Moving to Gold OA is a novel step and indicates a desire to shake up the status quo in publishing to develop future benefits. Both the UK and the Netherlands are seen as leaders in the field taking active steps towards a Gold OA model. If being a leader in the international space can lead to a greater share of Gold OA internationally, this will bring clear benefits to Switzerland, as indicated in Chapter 6.

Blue OA still represents OA, but is less disruptive than a Gold OA approach. Switzerland may be seen as less of an international leader by adopting such an approach.

Developing university presses

A Gold OA model may lead to university presses taking on a more predominant role in the university space as new OA journals are continuing to be developed.

A Blue OA model would do less to re-establish university presses as a key player in the publishing space.

Additional criteria: Supported by traditional publishers

Support of traditional publishers may seem a peculiar criteria as disrupting a profitable model to benefit Swiss institutions will seem to be a zero-sum game. The reason we include this is because even if Switzerland move to full Gold OA production, they will need to take out subscriptions to access international articles coming through a traditional publishing channel. The distinction may be more difficult as many of the traditional publishers also have OA operations.

Gold OA as a more disruptive model is likely to be less favoured by traditional publishers. This has the potential to lead to greater cost increases if publishers choose to adopt such an approach – however, it is unclear that a hostile approach will be beneficial in the long-run.

7.3. Recommendations

There is clearly appetite to move to OA in Switzerland as demonstrated by our qualitative questionnaire. There are benefits to moving to Gold OA and Blue OA. We summarise reasons why Switzerland may wish to move to these models below.

Gold OA

This model will be higher cost than Blue OA in the transition, but demonstrating the commitment to such an approach with higher short-run costs to bring about lower future costs would establish Switzerland as a leader on the world stage and set an example for others. If this facilitates greater Gold OA at the global level, this would bring about significant savings for Switzerland, and more than if there is an international move towards Blue OA.

An advantage of gold OA is that the publishing model may be more competitive and the journal authors are thus less able to command as much market power in setting costs. This has benefits from an author and institutional perspective. University presses may be more likely to be developed under this approach.

Blue OA

As gold OA remains a small proportion of total publishing at the global level, a Blue OA model may provide more flexibility in a country where levels of international collaboration is especially high. The approach is also more consistent with book publishing and historically with open data.

Blue OA can deliver immediate cost savings under our assumptions. A shorter embargo period brings greater benefits under a Blue OA model. However, this assumes that there is not a large price rise in response to this approach and this backlash may mean that a Blue OA approach is not as efficient as assumed under our analysis.

Hybrid OA

All our scenarios and sensitivity analysis have demonstrated that Hybrid OA, even with an offset at 100%, is costly for the Swiss academic community. We do not recommend using this model even as a bridge model. APCs on Hybrid articles are more expensive than APCs on Gold OA articles and we remain doubtful that offsetting arrangements of up to 100% are likely in practice. Hence, it is possible that the double dipping issue will remain.

Overall recommendations

It is important that the approach chosen is practical and flexible to the needs of parties. From the qualitative questionnaire, there is no consensus around the best approach to OA, and as discussed above, there are arguments in favour of both Gold and Blue OA approaches.

If budgets cannot be increased, this may preclude a pure Gold OA model. If publishers are not receptive to moving to a Blue OA approach or require higher payments to do this, the cost benefits from a pure Blue OA model may not materialise. Moreover, there are a number of additional uncertainties and external factors that would impact on the choice for Switzerland.

Based on our analysis, we would recommend that a **Mixed Model of Gold OA and Blue OA** is chosen.

Supporting Gold OA would act as a signal to the global academic community that Switzerland is committed to move to an OA world. This is because, as opposed to any other models, Gold OA is the only model that has the characteristic of a global public good. Compared to Blue OA or a hybrid model, Gold OA is non-excludable: it is impossible to prevent any countries, for any length of time, to benefit from Swiss scientific research.

Hence, the global scientific community could benefit immediately and freely from Swiss research. If this supported a global movement in favour of Gold OA, Switzerland will benefit substantially, as our findings have demonstrated. However, if the global community does not show signs of cooperation - by not supporting Gold or Blue - we would advise Switzerland to keep the option of the Blue OA model open. It is the most cost effective model in this scenario.

The point we are underlining is that international cooperation can arise through a strategy of reciprocity, also coined "tit-for-tat" strategy. Implementing such a strategy occurs when a country cooperates in the first interaction with another and then mimics that country's proceeding moves. The idea is a country can reward another with good behaviour so it reciprocates with good behaviour. We think that by supporting Gold OA first and foremost, Switzerland would set up the conditions for international cooperation to support Gold OA. Meanwhile, ensuring that the mechanisms and the financing channels for Blue OA remain open would ensure that the cost of academic publishing do not spiral in the case that this change does not come about. It would also help minimise the impact on institutions most impacted by a transition towards Gold OA.

Table 7.1 offers a summary of our overall recommendations. We use a traffic light shading system to show the pros and cons of each models. The less saturated (grey shaded) areas indicate areas of significant uncertainty. This scoring is based on current context and transition within the 2015-24 period under our baseline scenario.

Table 7.1: Summary of recommendations[34]

	Gold OA	Blue OA	Mixed (Gold > Blue)
Primary considerations			
Acceptability / OA / Quality			
Funding requirement	 High cost - Potentially lowest if RoW adopts Gold	 Low cost Potentially medium if publishers increase their prices or embargo length	 Medium cost - Potentially low if RoW adopts Gold

[34] A traffic light rating system is a system for indicating the status of a variable using the red, amber, or green traffic lights.

Distributional impact	Research-intensive institutions lose regardless of what the RoW does.	Status quo remains	Research-intensive institutions mildly impacted
Additional considerations			
Meeting the need of researchers	Higher readership, but limited synergies	Less readership, but some synergies	Limited – some synergies
International partnerships	Least synergies	Satisfactory synergies	Unrestricted synergies
Financial restructuring	Highest	Lowest	Medium
Publishing impact	Low for the moment but could become standard	High	Medium-High
International leadership	Highest	Low	Medium high
Support of publishers	Low	High	Medium

7.4. Implementation – suggested actions

We provide recommendations on how to implement these proposals and support the development of the Swiss national strategy. A summary of the suggestions we make as regards to the implementation is provided in Figure 7.1.

7.4.1. Short-term (next two years)

Coordination, communication and action plan

It is critical that there is a clear national policy and support regarding OA. We see the strengthening of a National Strategy as a key initial step in achieving this coordination. Coordination will give proper

direction to all the institutions in Switzerland as regard to OA and may possible help achieve the transition faster.

While strengthening the National Strategy, communication with all the stakeholders must be maintained in order to gather ideas, adjust direction if needed and set expectation about goals, direction and benefits to the community.

As indicated as part of the National Strategy, it is important to have clear milestones and actions in place. We believe that a tailored action plan will be developed in the coming months to achieve this.

Improve data quality

A second, but parallel, step involves data quality. In making a decision over strategy for Swiss publishing, it is important that data is available to make an evidence-based decision. Therefore, data needs to be on a consistent basis and must be collected from all institutions. SNSF with their Monitoring Report have made progress is this regard and it is important to go further in this direction.

We would recommend that guidelines are developed on what information should be collected on an ongoing basis, clear definitions of the data required to ensure consistency, and a reporting structure/ systems established.

Annex C provides an overview on the issue with the data that was collected as part of this project. We think that improvement on some aspects of the data collected would help support further analyses:

- The number of articles/books received rather than the number of journals subscribed to. This would allow to find a precise estimate of the cost of conventional articles being paid by Swiss institutions. It would allow us to compare it to the APC cost charged on gold articles;
- The split between the different publishing models; i.e. conventional, gold, blue and hybrid. But also, how the share of green articles; those that were produced by institutions but not published and yet may appear in the statistics. It also demonstrates the importance of clearly communicating what OA models represent e.g. Yellow, Blue, Gold, etc.
- Whether an offsetting arrangement has been passed between libraries and publishers;
- The proportion of articles /books that are subscribed to on the basis of back-access.
- The detailed distribution of total income for universities. How much is allocated towards research, teaching, subscription expenditure, publication expenses. Moreover, it would be useful to have a clearer indication on the sources of these funds.

International partnerships

We have reiterated the impact of global policymakers on the costs faced in Switzerland. There are clear benefits to Switzerland from other countries transitioning to OA. To help achieve this, Switzerland should continue to play a key role in international discussions and act as a leader.

Once a National Strategy is put in place, Switzerland will have better prospect at influencing partners to develop their OA policies. We believe that four aspects of international co-operations are relevant:

- **Data collection**: collecting data at the European level and more widely across the main research producing institutions would be beneficial for all countries in their transition towards

Open Access. As this report has highlighted, there are significant interdependencies between national and foreign research production and consumption. Evidence-based decision making on the optimal OA model to adopt needs a clear understanding of OA at home and abroad.

- **Defining OA models**: We believe it is important that OA models be properly defined and understood so that data can be compared across constituencies.
- **Working groups**: Joining forces, for example by setting up international working groups, will help the knowledge sharing and ability of Switzerland to push its agenda. Working closely alongside the UK and Netherland who have been leading the Gold OA transition are example of partnerships that could be fostered.
- **Developing OA infrastructure**: The role of collectives and platforms to facilitate OA is crucial e.g. Open Library of Humanities. The Austrian FWF has made grants available to 'flip' conventional journals to OA - this may be better facilitated at the international level if agreement can be reached.

7.4.2. Medium term (to 2020)

Support for transition of certain journals

There are certain journals that we would expect to face an easier transition to OA, for example those with high impact factors, but a low number of subscribers under a conventional model. Research has indicated that OA content in journals is read more widely than subscription content and so expanding readership should mean it is more likely to create greater scientific impact. We would expect these journals to be more likely to move to OA. However, other journals that have large subscriber bases are likely to have more of a cost impact from switching to OA.

Depending on the degree of intervention that the Swiss public funders are ready to get involved in, there is room for influencing the publishing market. By supporting key OA journals, this may have the potential to increase competition on OA publishing and, overtime, push down the cost of OA.

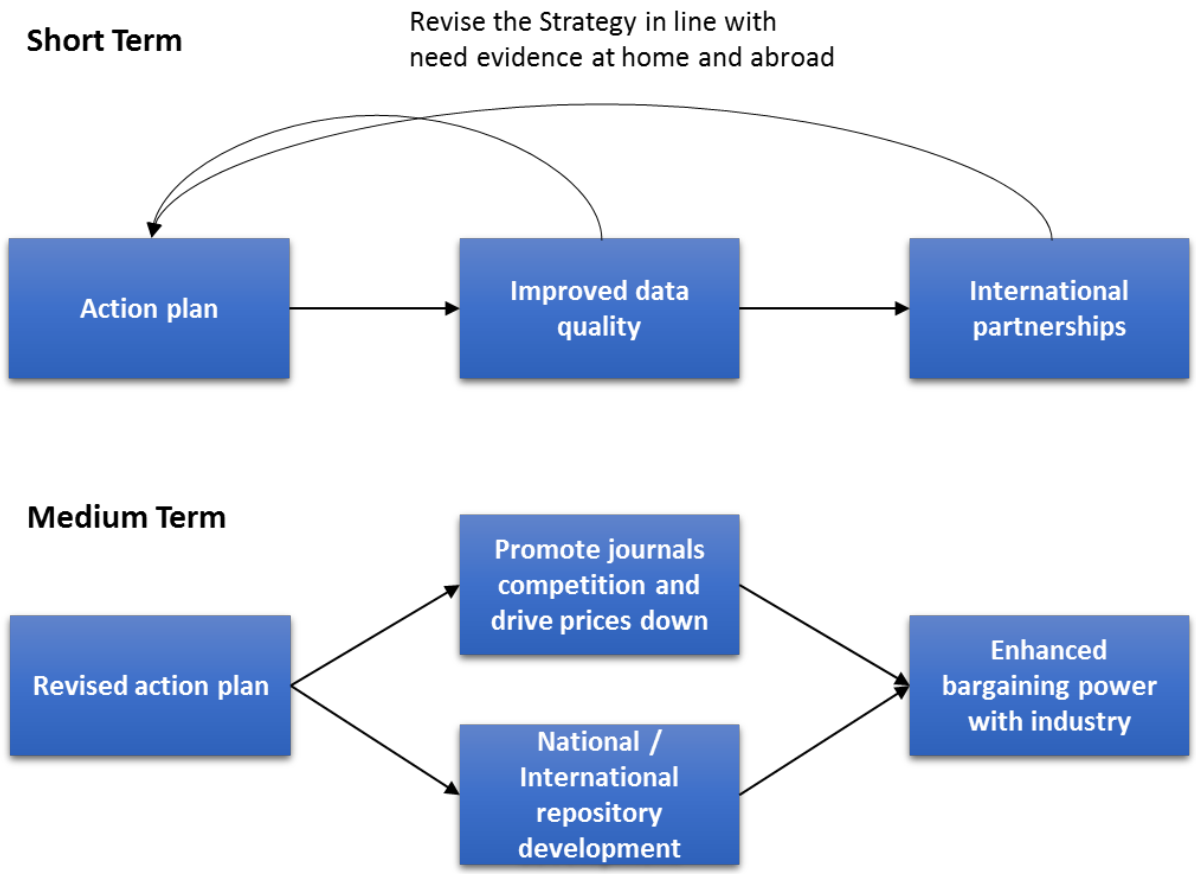
Bargaining power

The financial impact of different models ultimately depends on the bargaining power that Swiss institutions possess. Where institutions are disjointed and in disagreement, publishers are likely to be better placed to capitalise on their relative strength in negotiations. This could lead to price increases, not just on subscriptions, but on APCs as well. As indicated in Chapter 6, a shorter embargo period can lead to significant benefits and achieving this may require concerted effort in a unified fashion, as witnessed with the Netherlands.

Repository development

To develop an OA model requires a repository for archiving and accessing articles. There are numerous ways in which this could be achieved, from individual institutional repositories to subject repositories. As discussed in the qualitative questionnaire, there are benefits for smaller institutions operating an integrated repository and this infrastructure should be a key part of future strategy.

Figure 7.1: Summary of implementation recommendations



Source: CEPA

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ANNEX A MODEL USER GUIDE

In this annex, we set out a user guide for our modelling of financial flows.

A.1. Inputs, assumptions and scenarios

A.1.1. Physical flows

In 2015, Switzerland produced 30,844 articles. It is estimated that this represents 1.2% of the global articles production (2.56 million).

According to the data collected from Swiss stakeholders (and cross-checked with public statistics), the financial flows within Switzerland predominantly go towards conventional (70%) and Blue (16%) articles. These are acquired through subscription packages. Gold OA and Hybrid OA are less common financing models (11% and 3% respectively). An overall OA share of 30% in Switzerland compares to a 22% share at the global level.

Table A.1: Article production in Switzerland in 2015

Model	Volume		Split	
	Central estimate[35]	Uncertainty range[36]	Central estimate	Uncertainty range
Total	30,844	±20%	100%	±0%
Conventional	21,513	±9%	70%	±12%
Gold	3,490	±22%	11%	±2%
Blue	4,870	±67%	16%	±49%
Hybrid	972	±26%	3%	±6%

Swiss institutions consume research from international institutions, and as such, the number of articles produced outside of Switzerland is relevant for our modelling. Table A.2 shows our central estimate for global article production in 2015.

We have assumed that Switzerland consumes the total articles produced domestically (Table A.1) and internationally (Table A.2). Conventional, pre-embargo Blue and Hybrid articles were paid for through subscription expenditure while Gold and post-embargo Blue articles were consumed free of charge.

[35] Central estimate figure refers to our best estimate of the information; in this case, it refers to publication volumes.

[36] The uncertainty range figure represents the difference between the high and low estimates for the figure. Therefore, a small value indicates a narrow range and a high value indicates a broad range.

Table A.2: Article production in the Rest of the World in 2015

Model	Volume		Split	
	Central estimate	Uncertainty range	Central estimate	Uncertainty range
Total	2,568,251	±5%	100%	±0%
Conventional	2,003,236	±5%	78%	±0%
Gold	364,692	±3%	14%	±2%
Blue	138,686	±4%	5%	±1%
Hybrid	61,638	±6%	2%	±1%

A.1.2. Financial flows

There are two types of expenditure related to publishing models:

Direct costs are those related to the article itself (in either production or consumption). This involves the cost of reviewing, publishing and distributing a piece of research. Direct costs are shown in Table A.3. From this information, we can derive the price per article. Table A.4 provides an overview of the price per article.

Indirect costs are those that are associated with the infrastructure cost to support the archiving of OA work. Universities reported a cost for infrastructure of CHF 2.4 million in 2015. We used the total value of infrastructure as reported by Swiss libraries.

Table A.3: Expenditure per Model in Switzerland (in CHF)

Model	Value (CHF)		Split	
	Central estimate	Uncertainty range	Central estimate	Uncertainty range
Total	76,242,330	±31%	100%	±0%
Conventional	67,080,787	±27%	88%	±4%
Gold	4,433,530	±23%	6%	±8%
Blue	2,954,375	±29%	4%	±30%
Hybrid	1,773,638	±62%	2%	±35%
Infrastructure	2,428,902		NA	

Swiss institutions spent CHF 67 million on conventional articles; two million conventional articles are consumed annually. This leads to a per article charge of CHF 33 if one divides expenditure by the number of articles. However, there will be overlap as the expenditure may cover different institutions having access to the same articles.

This price should not be viewed as an output in itself (the price being effectively paid by each Swiss institution), but a tool for pricing different OA scenarios. Pricing articles based on data at the National level as opposed to at the University level allows us to simplify the modelling approach.[37]

Table A.4: Price per article per model (in CHF)

Model	Price per article (CHF)	Uncertainty
Conventional	33	±27%
Gold	1,409	±11%
Blue	33	±27%
Hybrid (APC)	1,755	±69%
Hybrid (Sub)	33	±27%

It should be noted that for Gold and Hybrid APC costs, this is weighted across all articles of that type. Where APCs are not charged (Platinum OA), this will be blended within the Gold OA rate. For example, if for Gold OA APCs are only charged in half of cases, this would imply that where the Gold APC charged would be twice as high (i.e. CHF 2,816).

A.1.3. Other assumptions

Other assumptions involve the discount rate on hybrid Gold OA offsets, the length of the embargo period for Blue articles and the degree of back access allowed for conventional articles.[38]

Other assumptions	Value
Offset percentage discount	100%
Embargo period (months)	12
Back access	100%
Hybrid (APC)	1,755

[37] This assumes that articles are only being paid once by the whole of Switzerland. In practice, several universities subscribe to the same journals and the same articles, therefore paying for a given article multiple time. Hence, the average cost per conventional article is lower than that. However, accounting for this specificity would greatly increase the complexity of the modelling approach and data on how many times articles are being paid for is not available. This would require a large degree of coordination to achieve in practice.

[38] Back access description contained in previous footnote.

A.2. Building block calculations

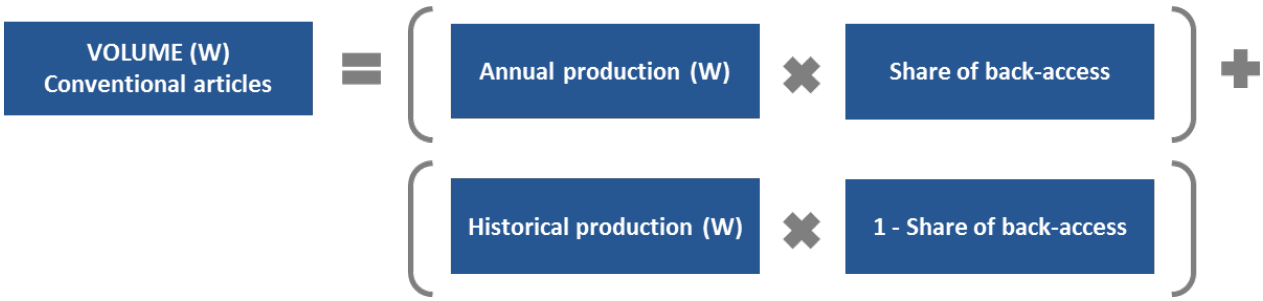
This section details the initial calculation steps to estimate the funding requirement of each publishing model. At a high level, the funding for each model is calculated by taking the quantity of publications multiplied by the price per work published under this model.

There are however, subtleties associated with whether the work is priced at the production or consumption stage (author-pay vs reader-pay) and whether the volumes involve articles produced in Switzerland or at the global level. We detail each publishing model in turn.

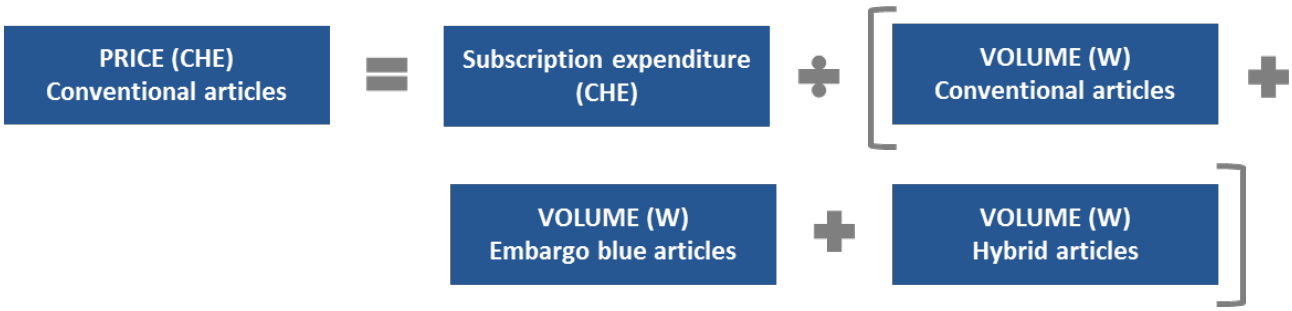
A.2.1. Conventional articles

As part of their subscription packages, Swiss libraries and universities have access to the research produced by the global scientific community. Therefore, the volume of conventional articles paid for by Swiss institutions is a global volume, not a Swiss volume. This is signalled in the figure below by the symbol (W), standing for World.

In a given year, Swiss libraries and universities have access to the scientific work produced in that year but also any historical production. Publishers treat and price access to current and historical production of content differently. Some publishers allow their customer perpetual access to a given year of content paid for. This is referred as 'back access'. Others offer different arrangements. Ultimately, the final volume of publications that is paid for by Swiss institutions depends on the flow (annual production) of articles and access to the stock (historical production) of articles.



Conventional article fees are paid to publishers (including subscriptions) by readers; i.e. it is a reader-pay model. The data collection gives us an estimate of the subscription expenditure paid by libraries. However, this subscription expenditure covers the cost of conventional articles but also Blue articles (under embargo) and hybrid articles. Assuming all three types of articles are priced equally under a subscription package, we can find the price per conventional article as detailed in the formula below. Importantly, note that we divide the Swiss subscription expenditure by the global number of articles.



Taking together the volume and price per unit, we can find the total funding in any given year.[39]

A.2.2. Gold OA

Calculating the funding for Gold article is simple. We take the annual Swiss production of Gold OA (CHE) and multiply it by the reported article processing charge in Switzerland. The production of Gold OA is independent from global production.

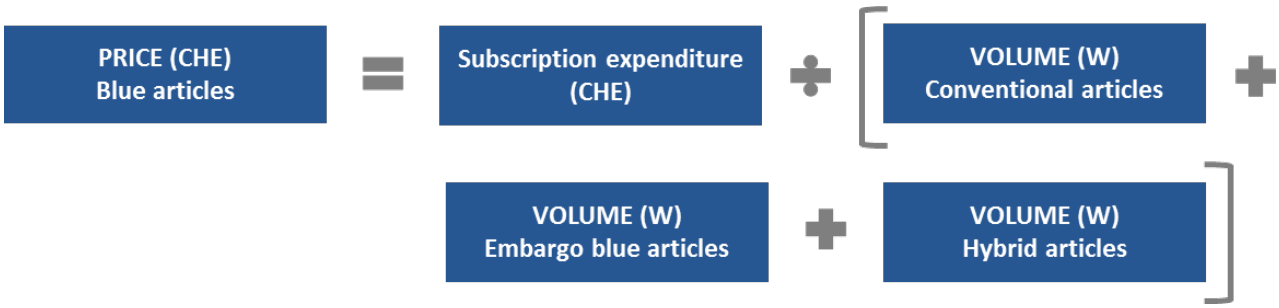
A.2.3. Blue OA

Blue OA articles can be found as part of subscription packages – until they reach the end of their embargo period. Blue OA financing is dependent on global production. Like conventional articles, the number of Blue OA articles paid in subscription journal involves the Swiss Blue OA production but also the global OA production. We therefore need to account for the global volumes.

Moreover, in a given year, the number of Blue articles within subscription packages is a function of the number of articles produced in that year plus those produced in previous years that are still under embargo.

The price faced by Blue article is the same as that computed for conventional articles.

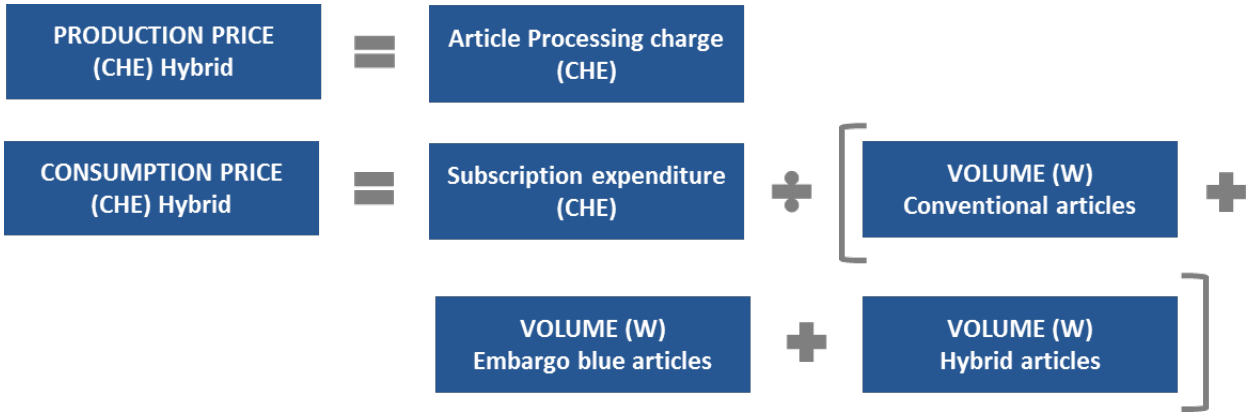
[39] We do not have information on those journals/ articles that are subscribed to by Swiss institutions. We have therefore made the simplifying assumption that Switzerland accesses all articles produced. As this remains the same for current and future flows, this should not affect our modelling results.



Again, the financial flow for Blue is the product of world volume and Swiss price.

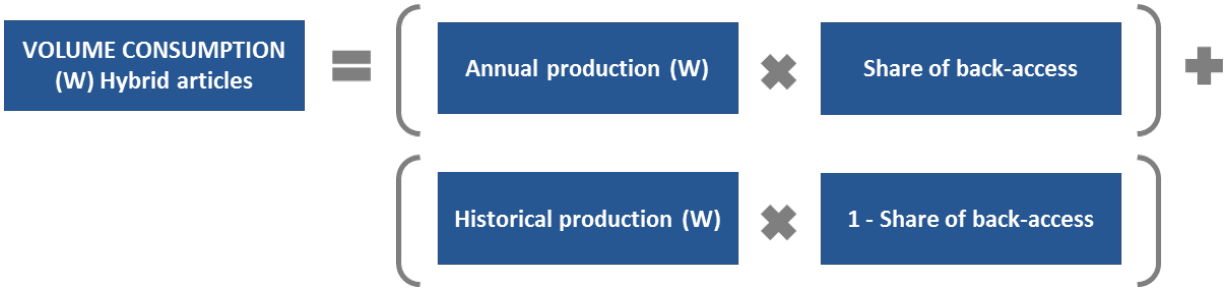
A.2.4. Hybrid + offsets

Hybrid also involves some complication. Starting with the price: the hybrid model faces a production and a consumption price. The price paid by authors is the APC on hybrid. Our research has shown that the APC for hybrid is different than the APC for Gold OA. Therefore, the APC in the box below is not the same as the one in the Gold OA calculations. The consumption price is the same as the price paid for conventional and Blue articles.

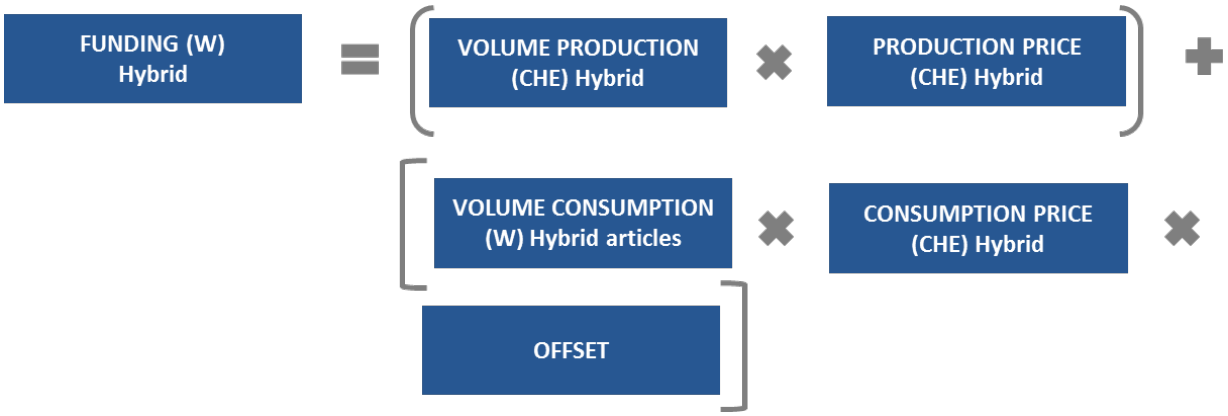


The volume involves the Swiss production of hybrid articles.

However, it also involves the consumption of hybrid article by the rest of the world. Consideration of back access also arises here.



Finally the funding is the sum of the production funding from Swiss authors and the discounted consumption expenditure by Swiss readers.



A.2.5. Infrastructure costs

We found from library responses to our questionnaires that Switzerland spent CHF 2.4m on infrastructure for the support of article archiving in 2015 (in total for Gold, Blue and Yellow OA). For simplicity, we have assumed that these CHF 2.4m only accounted for ongoing expenditure. Hence, we assumed that in 2015 Switzerland did not build new archives but has simply maintained its existing stock as no further information was available. We estimated that Swiss universities/libraries currently have 18 OA archiving facilities.[40]

In order to model future infrastructure requirements, we estimated as a rule of thumb that Switzerland needs a total of 40 archiving facilities by 2024. We estimated that close to CHF 375,000 were needed for the construction of a single infrastructure and CHF 120,000 annually to maintain it based on these assumptions. With these values we can forecast a baseline for 2015 (assuming the number of infrastructures stays the same; i.e. 18) and future outturn (projected to reach 40 by 2024).

[40] Based on qualitative questionnaire responses. There are 17 listed in the Directory of Open Access Journals (OpenDOAR) http://www.opendoar.org/find.php.

ANNEX B CONTEXT OF GLOBAL PUBLISHING

The costs around OA for Switzerland depend on the production and distribution of scientific research on a global basis. The choices other countries make will affect, for example, the extent Swiss institutions need to continue with subscriptions to access internationally produced research. If Switzerland moves to an OA model, this does not immediately remove the need to continue paying such subscriptions. As such, the global context is a critical driver of our analysis.

B.1. European-level developments

At the European level, there is a clear drive towards OA. We have already quoted the Competitiveness Council of the European Union target for all scientific papers to be made freely available by 2020.[41] The form of this OA has not been specified however and it may be that countries choose to go down the 'Gold route' or the 'Green route' as their primary policy direction.

At the European level there appears to be a preference towards Green OA in the short-term, with the exception of Netherlands and the UK.[42] Some countries aim for Gold OA in the longer run e.g. Austria and Denmark, but this is following a transitional process involving Green OA.

While there has been limited legislation put in place by governments themselves (Italy, Spain and Denmark being exceptions), much of the drive towards open access has been from national research institutions and mandating open access for recipients of their funding. Examples include the German Research Foundation (DFG), Agence Nationale de la Recherche (ANR) in France, the Netherlands Organisation for Scientific Research (NOW) and Research Councils UK (RCUK).

7th Framework Programme (FP7)

The European Commission had a research and innovation funding programme for 2007-13. This was known as FP7 and was replaced by Horizon 2020, but FP7 funded projects still are ongoing today.

Horizon2020 (H2020)

H2020 is the biggest EU Research and Innovation programme in history, with €80bn available over seven years (2014-2020). This funding aims to implement the Innovation Union, a Europe 2020 initiative that concerns Europe's global competitiveness.[43] The target is for Europe to produce world-class science, remove barriers to innovation and make it easier for public and private sectors to work together.

OpenAIRE

To deliver the anticipated benefits from OA, the European Commission has financed the development of an electronic infrastructure for OA research. This is set up across seven different disciplines (energy, environment, health, cognitive systems, e-infrastructure, science and society and social sciences/ humanities).

[41] The Competitiveness Council includes Ministers of Science, Innovation, Trade and Industry in Europe.
[42] Language used does not tend to differentiate between yellow and blue models.
[43] See: http://ec.europa.eu/research/innovation-union/index_en.cfm

B.2. Rationale for OA at the European level

The benefits of OA as a more competitive model is set out by JISC in the UK,[44] who use features of the existing model compared to OA publishing to demonstrate why they think that the OA model is better for customers.

Table 8.1: JISC's comparison of publishing models (direct copy)

	OA Market	Legacy subscription/ hybrid market
Market concentration	Market concentration is low. In 2015, the ten largest publishers only accounted for 16% of all OA journal titles.	Market concentration is relatively high. In 2015, the ten largest publishers accounted for 45% of all subscription/ hybrid journals.[45]
Barriers to entry	There are low barriers to entry. Seven of the ten OA journal publishers with the largest range of titles were founded since 1994. The success of diverse new publishers in OA market, such as the Public Library of Science (PLoS) and Hindawi, is evidence that this market features high levels of innovation, new technologies and business models that enable new entrants to operate at scale and to compete with incumbents.	There are high barriers to entry. Eight of the ten journal publishers with the largest range of titles were founded before 1900. A variety of structural features limit the opportunities for new entrants and create significant barriers that very few new publishers have been able to overcome in recent years.
Strength of customer response	Customer response in terms of price sensitivity is relatively strong. *"…we believe that for full OA journals, author sensitivity to the levels of APCs has been working effectively in creating pressure to moderate the price of APCs."*	Customer response in terms of price sensitivity is weak. *"…hybrid OA articles are significantly more expensive than their full OA counterparts and the price level is an important factor in inhibiting uptake of the hybrid option."*

Source: JISC (https://www.jisc.ac.uk/reports/academic-journal-markets-limitations-consequences-for-transition-to-open-access)

B.3. European countries' policies

We provide specific examples of the policies of European countries to provide greater context for the decisions facing Switzerland. We focus on the Netherlands, UK and Austria as these countries have been active concerning OA.

[44] https://www.jisc.ac.uk/reports/academic-journal-markets-limitations-consequences-for-transition-to-open-access

[45] This has increased from 35% in 2009, mainly due to large commercial publishers taking over publishing operations from learned societies that operate close to the academic community

B.3.1. Netherlands

The Netherlands had the EU presidency in the first half of 2016, and open access was designated as a focal point – aiming to give open access awareness a boost in the EU. The Netherlands Ministry of Education, Culture and Sciences is in favour of open access but it lacks a written open access policy. However, The Netherlands Organisation for Scientific Research (NWO), has an open access policy, most notably a grants programme for the costs of author fees. From December 2015 NWO has made open access mandatory for all calls for proposals by changing grant conditions, so that all publications resulting from NWO funding must be openly accessible and public immediately at the time of publication. The Association of Universities in the Netherlands (VSNU), as is the case with NWO, supports this choice for the Gold route. '*According to the VSNU, 'Green' is a good addition to the options that are currently already available, and a good intermediate step, but not the sustainable solution that is needed, as the Gold route is expected to replace the current publishing model in time.'*[46]

UKB (a Dutch consortium of the thirteen university libraries and the National Library of the Netherlands), VSNU and SURF (the collaborative organisation for ICT in Dutch education and research), launched talks with eight major publishers, which together account for 70-80% of the turnover of Dutch scientific publications. They have managed so far to arrange an open access agreement with four publishers, SAGE, Springer, Wiley and Elsevier. According to these agreements, all journal articles, whose authors are affiliated with Dutch universities, will be made immediately openly accessible either at no extra cost or with limited cost for the authors.[47]

B.3.2. UK

The UK government's policy on open access *'favours Gold OA over Green OA, it promotes publishing in hybrid journals, it supports the principle that public funding should be made available to cover for APCs, it allows longer embargo periods for Green OA when APC funds are not available (12 months for STEM /24 months for HASS), and it requires CC BY licence for Gold OA but it is flexible on Green OA'*.[48]

The Research Council UK (RCUK) is a consortium of seven research councils in UK that fund research in 170 educational institutions for 2015/16, it will make available £22.6 million to support the implementation of its open access policy. Whilst the Gold route is the preference of RCUK, it allows a mixed approach to OA; with the decision on which model to follow remaining at the discretion of the researchers and their research organisations.[49]

An independent review of RCUK in 2014 found that whilst *'the majority of institutions have made a substantial start in implementing the RCUK policy, the evidence from the compliance returns provided by institutions is that many did not have the systems in place to either track publications produced by their own research staff or to associate publications with specific grants. This was especially the case for larger, distributed institutions (such as the research intensive universities) and distinct from smaller, more centralised institutions.'*[50]

[46] http://www.magazine-on-the-spot.nl/openaccess/eng/
[47] http://www.openaccess.nl/en/in-the-netherlands/national-agreements
[48] www.pasteur4oa.eu/sites/pasteur4oa/files/resource/UK%20Case%20Study.pdf
[49] http://www.rcuk.ac.uk/documents/documents/rcukopenaccesspolicy-pdf/
[50] http://www.rcuk.ac.uk/documents/documents/openaccessreport-pdf/

Funding Councils such as the HEFCE (Higher Education Funding Council for England) and HEIs (Higher Education Institutes) favour Green open access rather than the government's and RCUK's preference for Gold open access. This is due to the investments made in institutional repositories, plus *'a shift in policy imposes new burdens to HEIs and academic libraries. For instance, they have to consider how to manage the payments of APCs and RCUK block grants, how to comply with distinct funders policies, and how to search for and plan alternative funding mechanisms when funders' grants are not available to cover for APCs.'*[51]

B.3.3. Austria

The Austrian Research Fund (FWF) is the main funding agency in Austria for scientific research with a mandatory OA policy (the cost of which is reimbursed by the Fund). FWF also set up the Austrian OA Network (OANA) which is a voluntary bottom-up initiative with 54 member organisations. Publications must be archived in an OA depository (preferably an institutional depository) within twelve months of publication; research data should be deposited in OA archives within two years of completion.

The Austrian Partnership Programme in Higher Education and Research for Development (APPEAR) announced its open access policy, according to which the results of all APPEAR-funded projects need to provide open access. This is a mixed open access policy, where compliance is met both with publishing in journals (pure open access and hybrid) and repositories (subject and institutional), with a Creative Commons license.[52]

The Austrian Academy of Sciences (OAW), which is both a learned society and a large research institution, has a non-mandatory OA policy favouring the Green route; runs an institutional repository; and has a ROMEO Green publishing house, which also publishes Gold OA books and journals. Several institutions, including the University of Vienna, IST Austria, and the FWF have or plan to have publication funds for Gold OA.

FWF and the Austrian Academic Library Consortium (KEMÖ) have negotiated deals with the publishers Springer, Taylor & Francis and IOP. 16 Austrian institutions have also been the first to commit themselves to fund the Directory of OA Journals (DOAJ) at least for the next two years with € 28.5m p.a.

Core Recommendations by FWF and OANA include:[53]

- By 2017, all research and funding organisations financed by public sources should officially adopt and implement their own OA Policy and make OA obligatory in 2020.
- From 2016 to 2018, provide a transparent overview of the costs of the current publication system.
- By 2018, for publication venues being funded by public resources, the funding conditions should be such that the publication venues can be transformed to OA.
- By 2020, make contracts with the publishers transparent.

[51] http://www.pasteur4oa.eu/sites/pasteur4oa/files/resource/UK%20Case%20Study.pdf
[52] http://sparceurope.org/tag/oa-publishing/
[53] https://zenodo.org/record/35203/files/Berlin12_FWF-OANA.pdf

- From 2020 onward, license agreements with publishers should be concluded in a manner that the research publications are automatically published OA.
- By 2018, all research and funding organisations should establish transparent publication funds to cover author fees for OA.
- From 2017 onward, all research and funding organisations in Austria should participate jointly in national and international initiatives that promote high-quality non-commercial publication models and infrastructures.

B.4. International policy outside of Europe

Context is not limited to Europe only. Developments in countries such as the USA will impact on the costs faced by Swiss institutions.

B.4.1. United States

As of February 2013 the US government announced a new open access policy which mandated all publications arising from taxpayer-funded research to be made free to read after a one-year embargo period. The mandate was adopted as part of the Consolidated Appropriations Act of 2014 (HR 3547). It applies to all agencies in the Departments of Education, Health and Human Services, and Labor that spend $100 million or more per year on research and development. It is believed this new policy will double the number of articles made freely available [?] each year. While in general the US prefers Green open access on the whole, some funders, such as the Bill and Melinda Gates Foundation, have supported policies which require immediate Gold open access. Also of note is that the National Institutes of Health (NIH), which is the largest medical research funder in the US, requires open access deposit within twelve months of publication.

In 2011, 21 universities and colleges such as Harvard University, Stanford University, Duke University and Concordia University in Montreal, established the Coalition of Open Access Policy Institutions (COAPI). The group will advocate on a national level for institutions with open access policies.

B.4.2. Canada

Canada introduced the Tri-Agency Open Access Policy on Publications in May 2015 to mandate open access to research articles funded by Canada's three major research agencies: The Natural Science and Engineering Research Council (NSERC), the Social Sciences and Humanities Research Council (SSHRC) and the Canadian Institutes of Health Research (CIHR). The policy stipulates that peer-reviewed journal articles produced from funded research must be made open access within 12 months of publication by either: publication in an open access journal or archiving in a subject repository or institutional repository. CIHR has had an open access policy since 2008 requiring researchers to make their peer-reviewed publications accessible within 12 months (this policy became mandatory in December 2012), the new Tri-Agency policy is largely based on this (CIHR's) pre-existing policy.

The Canadian Association of Research Libraries (CARL) is a key organisation in Canada’s open access movement; it has signed the Berlin Declaration whilst also offering full support to the Tri-Agency’s decision to launch its OA Policy on Publications through providing relevant resources about the Tri-

Agency's move on its website. CARL also provides information to SHERPA-JULIET, which maintains a global list of research funding organizations' open access policies.

B.5. Differences by subject

As with different policies mandated by different research funding agencies, there are also differences between subject / discipline. This is relevant context as it shows that different parties may have different concerns. An example may be with Humanities and Social Sciences (HSS) compared to Scientific Technical and Medical (STM) journals. HSS may be less likely than STM to push for open access, for the following reasons:[54]

- lower journal pricing, decreasing the urgency for alternative economic models;
- less availability of national-level funding (and less argument for doing so);
- higher peer review costs; and
- the prevalence of books as a format, which lends itself less well to OA.

[54] http://libraryguides.unh.edu/c.php?g=326385&p=2191168

ANNEX C INPUTS DATA

C.1. Institutions contacted

Nr	*Institution*	*Acronym*	*CEPA classification*	*Quantitative (university)*	*Quantitative (Library)*	*Qualitative survey*
1	**Bibliothèque cantonale et universitaire Fribourg**	BCUF	Library		✓	
2	**Bibliothèque cantonale et universitaire Lausanne**	BCUL	Library		✓	✓
3	**Berner Fachhochschule**	BFH	University of Applied Sciences			✓
4	**Berner Fachhochschule - 11 Libraries**	BFH-LIBS	Library		✓	
5	**Bibliothèque Publique et Universitaire Neuchatel**	BPUN	Library		✓	
6	**Biblioteca universitaria di Lugano**	BUL	Library		✓	✓
7	**Eidgenössisches Hochschulinstitut für Berufsbildung - 3 Libraries**	EHB-LIBS	Library			
8	**Swiss Federal Institute of Aquatic Science and Technology**	ETH-EAWAG	Federal Institute	✓		
9	**Library for the Research Institutes within the ETH Domain**	ETH-EAWAG-LIB4RI	Library		✓	✓
10	**Swiss Federal Laboratories for Materials Science and Technology**	ETH-EMPA	Federal Institute			
11	**Library for the Research Institutes within the ETH Domain**	ETH-EMPA-LIB4RI	Library			
12	**École polytechnique fédérale de Lausanne**	ETH-EPFL	Higher Education Institution	✓		✓
13	**École polytechnique fédérale de Lausanne - Library**	ETH-EPFL-LIB	Library		✓	
14	**Eidgenössische Technische Hochschule Zürich**	ETH-ETHZ	Higher Education Institution	✓		
15	**Eidgenössische Technische Hochschule Zürich Bibliothek**	ETH-ETHZ-LIB	Library		✓	✓

Nr	*Institution*	*Acronym*	*CEPA classification*	*Quantitative (university)*	*Quantitative (Library)*	*Qualitative survey*
16	**Paul Scherrer Institute**	ETH-PSI	Federal Institute	✓		✓
17	**Library for the Research Institutes within the ETH Domain**	ETH-PSI-LIB4RI	Library		✓	
18	**Swiss Federal Institute for Forest, Snow and Landscape Research**	ETH-WSL	Federal Institute	✓		✓
19	**Library for the Research Institutes within the ETH Domain**	ETH-WSL-LIB4RI	Library		✓	
20	**Stiftung Universitäre Fernstudien Schweiz**	FERNUNI	Higher Education Institution			✓
21	**Fachhochschule Nordwestschweiz**	FHNW	University of Applied Sciences			✓
22	**Pädagogische Hochschule Nordwestschweiz**	FHNWiPH	University of Teacher Education			
23	**Bibliotheken der Pädagogischen Hochschule Fachhochschule Nordwestschweiz**	FHNW-LIB	Library			
24	**Bibliotheken der Pädagogischen Hochschule Fachhochschule Nordwestschweiz**	FHNW-PH-LIB	Library		✓	
25	**Fachhochschule Ostschweiz**	FHO	University of Applied Sciences			
26	**Franklin University Switzerland**	FUS	Other Accredited Institution			
27	**Franklin University Switzerland - 2 Libraries**	FUS-LIBS	Library			

Nr	*Institution*	*Acronym*	*CEPA classification*	*Quantitative (university)*	*Quantitative (Library)*	*Qualitative survey*
28	**Haute école pédagogique des cantons de Berne, du Jura et de Neuchâtel**	HEP-BEJUNE	University of Teacher Education	✓		
29	**HEP-BEJUNE - 3 decentralised libraries**	HEP-BEJUNE-LIB	Library		✓	
30	**Haute école pédagogique Fribourg**	HEPFR	University of Teacher Education			✓
31	**Haute école pédagogique du canton de Vaud**	HEPL	University of Teacher Education			
32	**Haute école pédagogique du Valais**	HEPVS	University of Teacher Education			✓
33	**Fachhochschule Les Roches-Gruyères**	HES-LRG	University of Applied Sciences			
34	**Fachhochschule Les Roches-Gruyères Library**	HES-LRG-LIB	Library			
35	**Haute école spécialisée de Suisse occidentale**	HES-SO	University of Applied Sciences			✓
36	**Haute école spécialisée de Suisse occidentale - Libraries**	HES-SO-LIB	Library		✓	
37	**Interkantonale Hochschule für Heilpädagogik Zürich**	HFH	University of Teacher Education			
38	**Interkantonale Hochschule für Heilpädagogik Zürich Library**	HFH-LIB	Library		✓	✓

Nr	*Institution*	*Acronym*	*CEPA classification*	*Quantitative (university)*	*Quantitative (Library)*	*Qualitative survey*
39	**Hochschule Luzern**	HSLU	University of Applied Sciences	✓		✓
40	**Hochschule Luzern - 6 Libraries**	HSLU-LIBS	Library		✓	
41	**Graduate Institute of International and Development Studies**	IHEID	Higher Education Institution			✓
42	**IHEID Library**	IHEID-LIB	Library		✓	
43	**Kalaidos Fachhochschule**	KFS	University of Applied Sciences			✓
44	**E-university library**	KFS-LIB	Library			
45	**Médiatheque Valais**	MDT	Library			
46	**Interstaatliche Hochschule für Technik Buchs**	NTB	University of Applied Sciences			✓
47	**NTB Buchs**	NTBB	Library		✓	
48	**Pädagogische Hochschule Bern**	PHBERN	University of Teacher Education			✓
49	**Pädagogische Hochschule Bern Mediothek**	PHBERN-MED	Library			
50	**Pädagogische Hochschule Graubünden**	PHGR	University of Teacher Education			✓
51	**Pädagogische Hochschule Graubünden Mediothek**	PHGR-LIB	Library			

Nr	*Institution*	*Acronym*	*CEPA classification*	*Quantitative (university)*	*Quantitative (Library)*	*Qualitative survey*
52	**Pädagogische Hochschule Luzern**	PHLU	University of Teacher Education			✓
53	**Pädagogische Hochschule St. Gallen**	PHSG	University of Teacher Education			✓
54	**Pädagogische Hochschule St. Gallen - 5 regional didactic centers**	PHSG-LIB	Library			
55	**Pädagogische Hochschule Schaffhausen**	PHSH	University of Teacher Education			
56	**Pädagogische Hochschule Schaffhausen - Didactic center**	PHSH-LIB	Library			
57	**Pädagogische Hochschule Schwyz**	PHSZ	University of Teacher Education	✓		✓
58	**Pädagogische Hochschule Schwyz - Library**	PHSZ-LIB	Library		✓	
59	**Pädagogische Hochschule Thurgau**	PHTG	University of Teacher Education			✓
60	**Pädagogische** Hochschule Thurgau - Media Center	PHTG-MC	Library		✓	
61	**Pädagogische Hochschule Zürich**	PHZH	University of Teacher Education	✓		✓
62	**Pädagogische Hochschule Zürich - Library**	PHZH-LIB	Library		✓	
63	**Swiss Academy of Humanities and Social Sciences**	SAHS	Academy	✓		✓
64	**Swiss Academy of Medical Sciences**	SAMS	Academy			
65	**Swiss Academy of Engineering Sciences**	SATW	Academy			✓

Nr	*Institution*	*Acronym*	*CEPA classification*	*Quantitative (university)*	*Quantitative (Library)*	*Qualitative survey*
66	**Swiss Academy of Sciences**	SCNAT	Academy		✓	✓
67	**Swiss Federal Institute for Vocational Education and Training**	SFIVET	Higher Education Institution			
68	**Schweizer Hochschule für Logopädie Rorschach**	SHLR	University of Teacher Education			
69	**Swiss National Science Foundation**	SNSF	Research Funding Organisation	✓	✓	✓
70	**Staatsunabhängige Theologische Hochschule Basel**	STH	Other Accredited Institution			✓
71	Staatsunabhängige Theologische Hochschule Basel - Library	STH-LIB	Library		✓	
72	Scuola universitaria professionale della Svizzera italiana	SUPSI	University of Applied Sciences	✓		✓
73	SUPSI - Dipartimento formazione e apprendimento	SUPSI-DFA	University of Teacher Education	✓		✓
74	SUPSI-DFA Centro di documentazione	SUPSI-DFA-CD	Library		✓	
75	Scuola universitaria professionale della Svizzera italiana - 8 Libraries	SUPSI-LIB	Library		✓	
76	Facoltà di Teologia di Lugano	TDL	Other Accredited Institution			

Nr	*Institution*	*Acronym*	*CEPA classification*	*Quantitative (university)*	*Quantitative (Library)*	*Qualitative survey*
77	**Theologische Hochschule Chur**	THC	Other Accredited Institution			✓
78	**Theologische Hochschule Chur - Library**	THC-LIB	Library			
79	**Universität Basel**	UNIBAS	Higher Education Institution			✓
80	**UB Hauptbibliothek**	UNIBAS-UB	Library		✓	
81	**Universität Bern**	UNIBE	Higher Education Institution	✓		
82	**Universität Bern Bibliothek**	UNIBE-LIB	Library		✓	✓
83	**Université de Fribourg**	UNIFR	Higher Education Institution	✓		✓
84	**Université de Genève**	UNIGE	Higher Education Institution	✓		✓
85	**Université de Genève Bibliotheque**	UNIGE-LIB	Library		✓	
86	**Université de Lausanne**	UNIL	Higher Education Institution	✓		✓
87	**Universität Luzern**	UNILU	Higher Education Institution	✓		✓

Nr	*Institution*	*Acronym*	*CEPA classification*	*Quantitative (university)*	*Quantitative (Library)*	*Qualitative survey*
88	**Université de Neuchâtel**	UNINE	Higher Education Institution			✓
89	**Universität St. Gallen**	UNISG	Higher Education Institution			✓
90	**Universität St. Gallen Bibliothek**	UNISG-LIB	Library		✓	✓
91	**Università della Svizzera italiana**	USI	Higher Education Institution			
92	**Universität Zürich**	UZH	Higher Education Institution	✓		✓
93	**Hauptbibliothek Universität Zürich**	UZH-HBZ	Library		✓	
94	**Zentralbibliothek Zürich**	UZH-ZB	Library		✓	✓
95	**Zürcher Fachhochschule**	ZFH	University of Applied Sciences			
96	**Zürcher Fachhochschule - 3 decentralised libraries**	ZFH-LIB	Library		✓	
97	**Pädagogische Hochschule Zug**	ZG	University of Teacher Education	✓		✓
98	**Pädagogische Hochschule Zug - Library**	ZG-LIB	Library		✓	
99	**Zürcher** Hochschule für Angewandte Wissenschaften	ZHAW	University of Applied Sciences			✓
100	**ZHAW Library**	ZHAW-LIB	Library		✓	

Nr	*Institution*	*Acronym*	*CEPA classification*	*Quantitative (university)*	*Quantitative (Library)*	*Qualitative survey*
101	**Zentral- und Hochschulbibliothek**	ZHB-LUZERN	Library		✓	
102	**Zürcher Hochschule der Künste**	ZHK	Other AccreditedAccredited Institution			✓

C.2. Assessment of university and library data

Data	Issue	Usage in the model
Universities - Total funding received	Total funding received	This value is not used in the calculations. We use it to express the total cost per model as a function of total money used for research, teaching, etc.
Universities - Funding for research, teaching, publications and subscriptions	Incomplete data. Few universities provided their detailed income.	Not used
Library – journal subscription expenditure	Reliable data	Helps us estimate the cost per conventional articles. Also used to find out the proportion of volume consumed by each library given that volume data is not robust.
Library – book subscription expenditure	Reliable data	Same comment
Library – journal volume subscribed	Some libraries seem to have reported the historical number of journals subscribed to as opposed to the annual number.	Not used.
Library – book volume subscribed	Some libraries seem to have reported the historical number of books subscribed to as opposed to the annual number.	Not used.
Number of article / book per journal	No answers provided.	Not applicable
Subscription article / book produced	Reliable data	We made the assumption that all subscription articles / books produced but not placed repository are subscription articles; i.e. excluding for blue.
Gold OA article / book produced	Reliable data	We made the assumption that all gold articles / books produced but not placed repository are hybrid gold articles; i.e. excluding for hybrid gold.
Subscription article / book placed in repository	Reliable data	We made the assumption that all subscription articles / books

		placed in repository are blue articles.
Gold OA article / book placed in repository	Reliable data	We made the assumption that all gold articles / books placed in repository are full gold articles.

C.3. Global Parameters

Input	Value	Rationale/comment	Source
Annual growth rate of article production	5%	Average 2010-2013 Most recent found	The STM report (2015) An overview of scientific and scholarly journal publishing.
Annual growth rate of book production	5%	No statistics, we have assumed the same value for books and articles	CEPA own calculations
Share of Swiss production out of global article production	1.2%	Average 2009-2013 Most recent found	SERI (2016) Bibliometric analysis of scientific research in Switzerland 1981–2013.
Share of Swiss production out of global book production	1.2%	No statistics, we have assumed the same value for books and articles	CEPA own calculations
Baseline global article production	2,568,251	Average from various sources between 2009-2013 adjusted to 2015 using the annual growth rate	SERI (2016) Bibliometric analysis of scientific research in Switzerland 1981–2013. Bornmann (2014) Growth rates of modern science: A bibliometric analysis based on the number of publications and cited references. Plume & van Weijen and Scopus in The STM report (2015) An overview of scientific

			and scholarly journal publishing.
Baseline global book production	114,011	No statistics. Libraries have reported producing 1,366 books and 30,771 articles in 2015. We have used this ratio to find the total global book production based on the global article production found above.	CEPA own calculations
Global split across models for articles	78% 14% 5% 2%	Conventional Gold Blue Hybrid	RIN (2015) Monitoring the Transition to Open Access: A report for the Universities UK Open Access Co-ordination Group. Table 9.a right figure. We used other sources to create a range of estimates.
Global split across models for books	78% 14% 5% 2%	No statistics, we have used the same split used for articles.	CEPA own calculations
Gold OA APC for articles	CHF 1,567	Articles	Average of multiple sources: Max Planck (2015) DOAJ Survey (2014) Wellcome Trust (2014)
Gold OA APC for books		Few statistics. SNSF reports SNSF supports book publications from 5,000 up to 40,000 CHF in the context of the pilot project OAPEN-CH. Maximum grant of CHF 12,000 for a basic digital book publication and maximum grant of CHF 22,000 for an enriched digital book publication. However, the value of a grant	Qualitative questionnaire CEPA own calculations

		does not tell us about the APC cost itself. We have assumed that the cost per unit is about 11 times that of the article APC.[55]	
Hybrid OA APC for articles	CHF 2,964	Articles	Average of multiple sources: Lib4RI (2014) Open Access - An Overview and Current Trends Wellcome Trust (2014)
Hybrid OA APC for books		Same assumption as for Gold OA APC.	CEPA own calculations

[55] This is based on the ratio of the price per conventional book / price per conventional article. Price per conventional book = subscription expenditure on books / number of books subscribed to.

ANNEX D SUMMARY OF FINDINGS FOR EACH MODEL

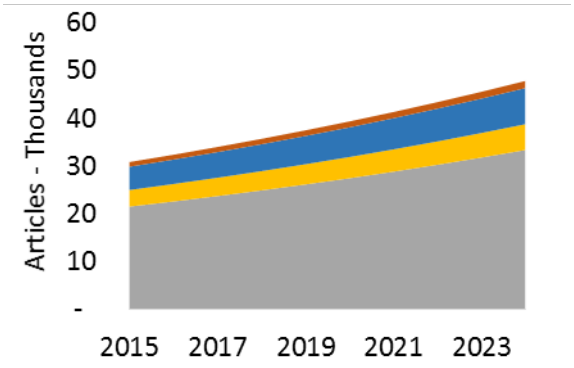
In this annex, we present the finding for each individual models.

D.1. Business as Usual

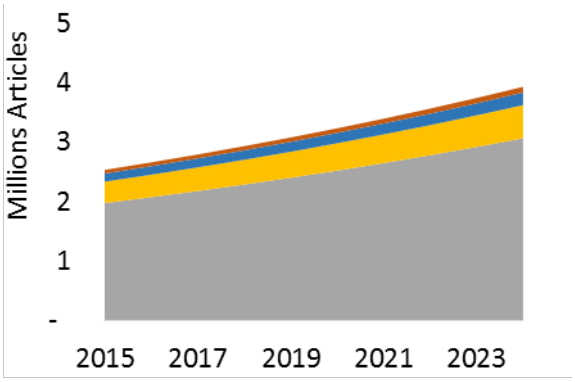
Business as Usual

Switzerland: The total volume of article produced (left) and consumed (right) increases at current growth rate (5%). The split between the models stay the same.

Article Production

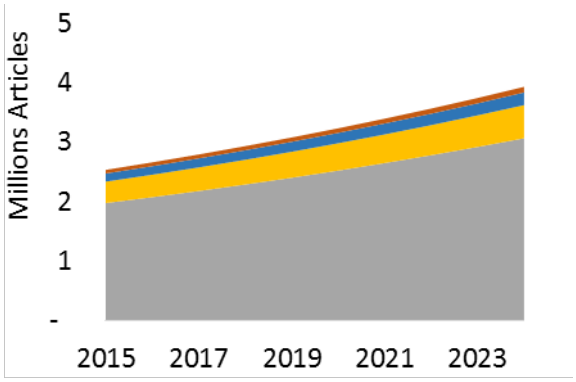


Article Consumption

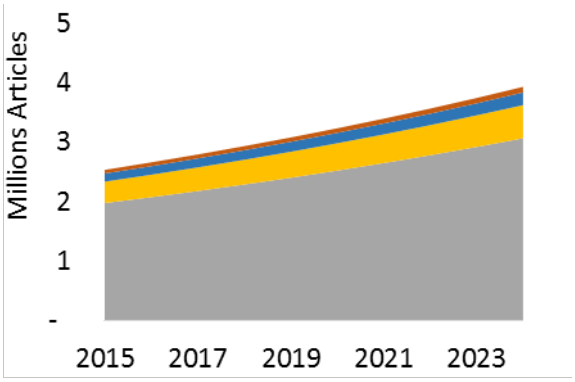


Rest of the world: Similar growth rate applies for the rest of the world. The consumption of Switzerland and the world is assumed to be the same.

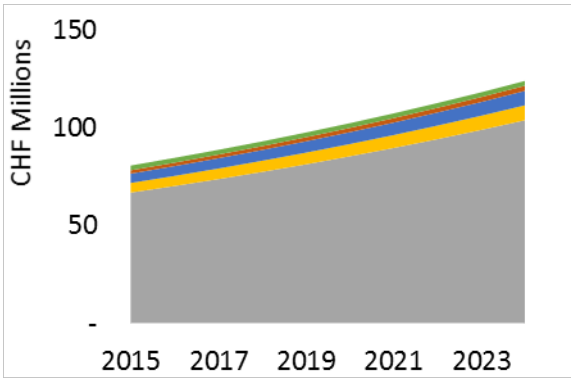
Article Production



Article Consumption



Funding: Under the Business as Usual world, the funding requirement for Switzerland increases following the rising production of articles.

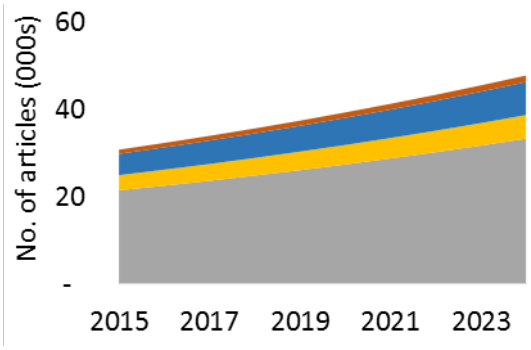


D.2. Gold

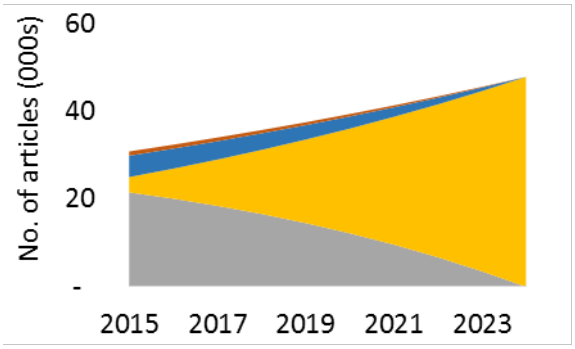
Gold					
Inputs					
	Consumption	**Production**	**Split 2015**	**Split 2024**	**Price (CHF)**
Conventional	2,003,236	21,513	70%	0%	33
Gold	364,692	3,490	11%	100%	1,409
Blue	138,686	4,870	16%	0%	33
Hybrid + offset	61,638	972	3%	0%	1,755

Article production - Switzerland

Business as Usual

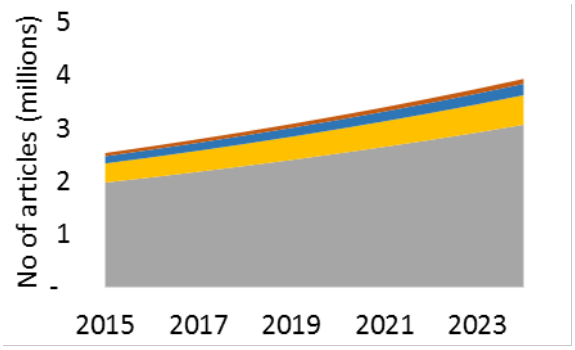


Scenario

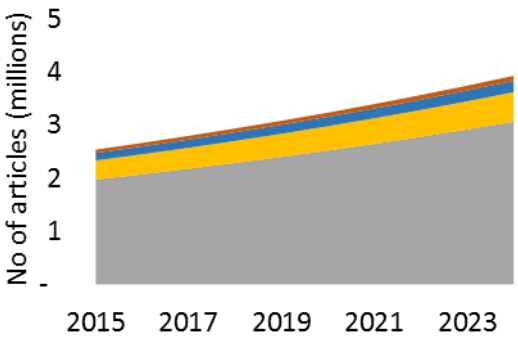


Article production - Rest of the World

Business as Usual

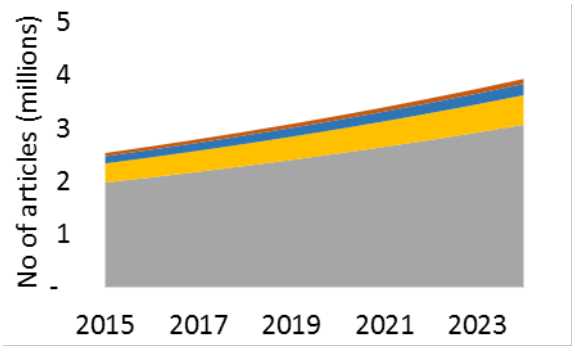


Scenario

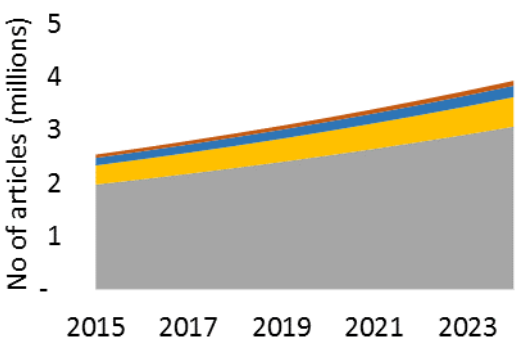


Article consumption - Switzerland

Business as Usual

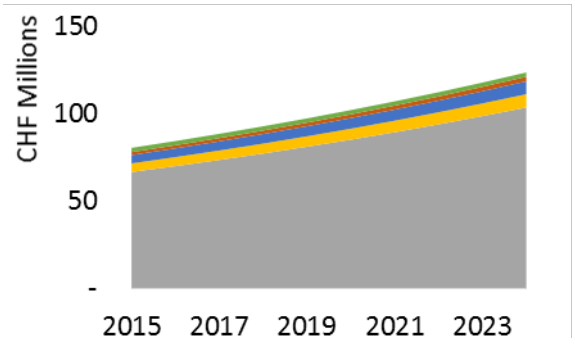


Scenario

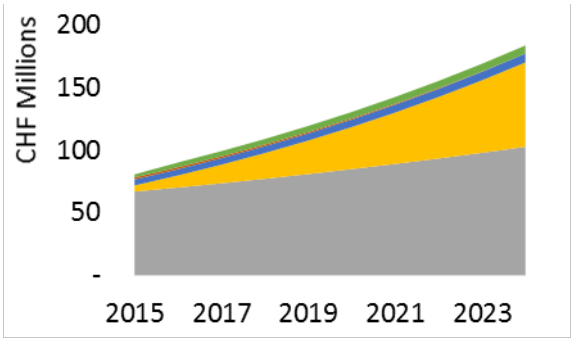


Funding requirement - Switzerland

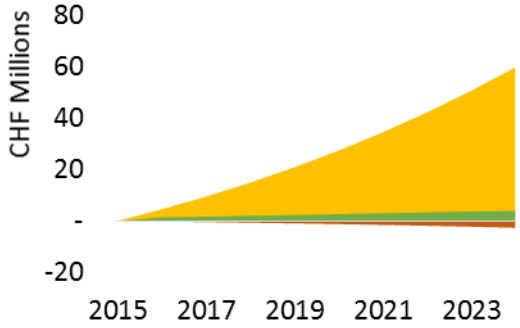
Business as Usual



Scenario



Net funding requirement



Funding requirement

	Total impact (CHF million)	**Annual impact** (CHF million)	**Impact** (% library funding)	**Impact** (% research funding)
Articles	271	27	26.8	0.28
Articles & books	404	40	53.4	0.42

Impact assessment

Average annual impact (CHF million)	**Average total impact** (% publication funding)	**Max annual impact** (CHF million)
0.86	0.36	13.99

Scenarios & uncertainty

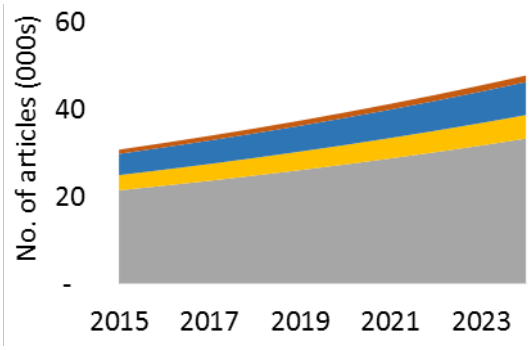
		Average annual impact (CHF million)		
Scenario	**Inputs**	**Best case**	**Reference**	**Worst case**
APC increase	CHF 1,755	12	33	61
Sub. prices increase	CHF 35	22	29	38
World goes blue	50%	20	27	34
World goes gold	35%	12	15	18
World goes gold	50%	6	6	6
Double dipping	0%	21	27	34
Embargo increases	Two years	25	33	42
Fast track transition	2020	27	36	46

D.3. Blue

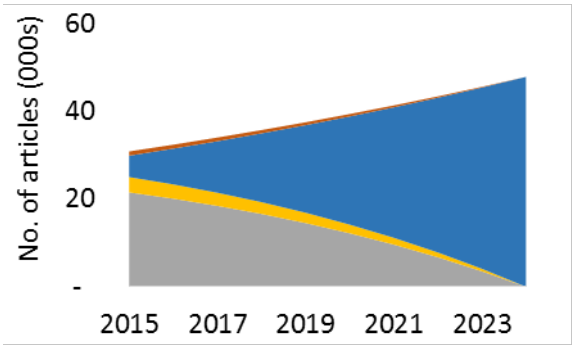
Blue					
Inputs					
	Consumption	**Production**	**Split 2015**	**Split 2024**	**Price (CHF)**
Conventional	2,003,236	21,513	70%	0%	33
Gold	364,692	3,490	11%	0%	1,409
Blue	138,686	4,870	16%	100%	33
Hybrid + offset	61,638	972	3%	0%	1,755

Article production - Switzerland

Business as Usual

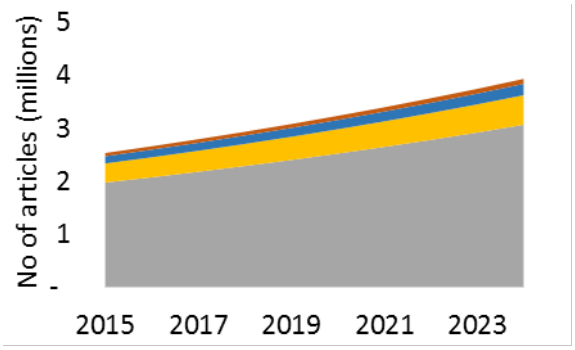


Scenario

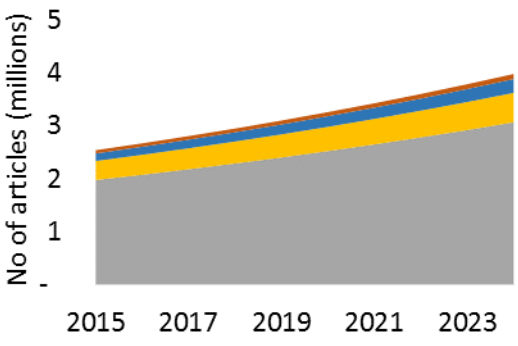


Article production - Rest of the World

Business as Usual

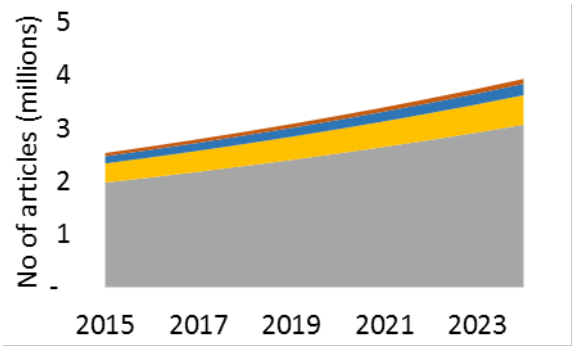


Scenario

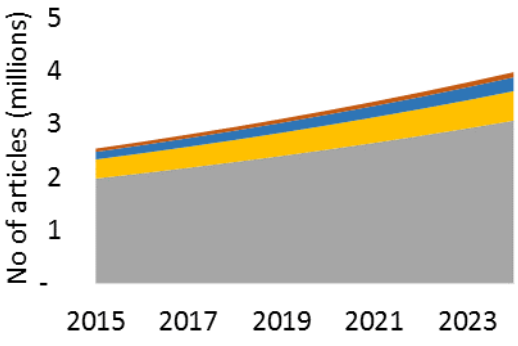


Article consumption - Switzerland

Business as Usual

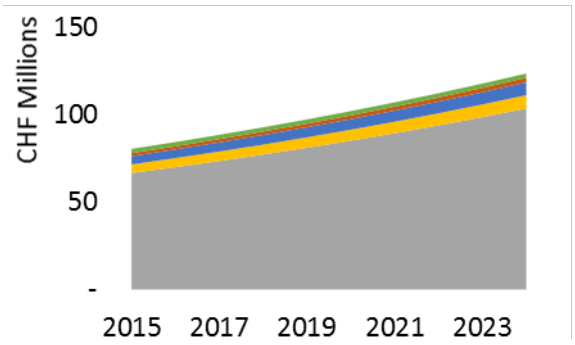


Scenario

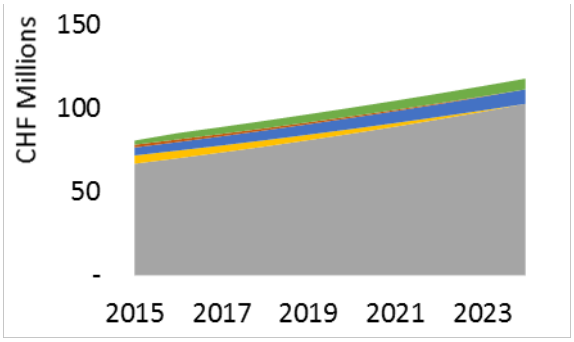


Funding requirement - Switzerland

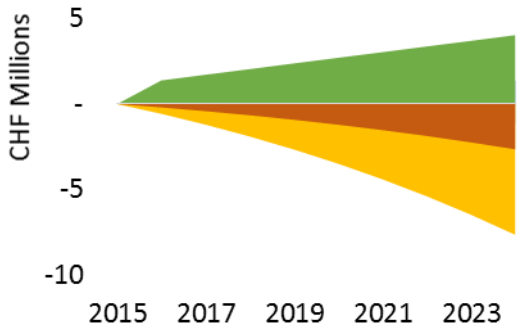
Business as Usual



Scenario



Net funding requirement



Funding requirement

	Total impact (CHF million)	**Annual impact** (CHF million)	**Impact** (% library funding)	**Impact** (% research funding)
Articles	-20	-2	-2.0	-0.02
Articles & books	-54	-5	-8.7	-0.05

Impact assessment

Average annual impact (CHF million)	**Average total impact** (% publication funding)	**Max annual impact** (CHF million)
-0.06	-0.05	0.52

Scenarios & uncertainty

		Average annual impact (CHF million)		
Scenario	**Inputs**	**Best case**	**Reference**	**Worst case**
APC increase	CHF 1,755	-1	-2	-3
Sub. prices increase	CHF 35	2	0	-1
World goes blue	50%	0	-2	-5
World goes gold	35%	-8	-14	-20
World goes gold	50%	-15	-23	-32
Double dipping	0%	0	-2	-4
Embargo increases	Two years	4	4	4
Fast track transition	2020	-1	-4	-7

D.4. Gold + hybrid offset

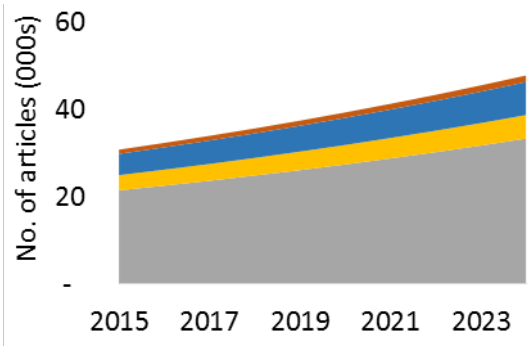
Gold + hybrid offset

Inputs

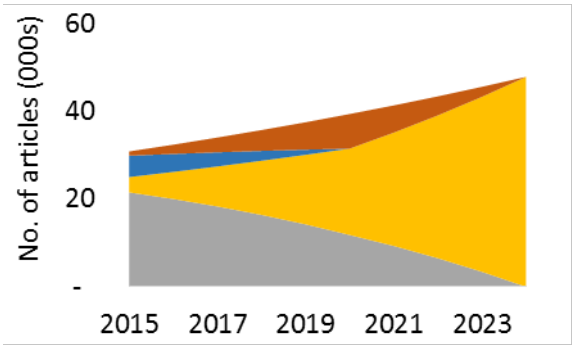
	Consumption	Production	Split 2015	Split 2024	Price (CHF)
Conventional	2,003,236	21,513	70%	0%	33
Gold	364,692	3,490	11%	100%	1,409
Blue	138,686	4,870	16%	0%	33
Hybrid + offset	61,638	972	3%	0%	1,755

Article production - Switzerland

Business as Usual

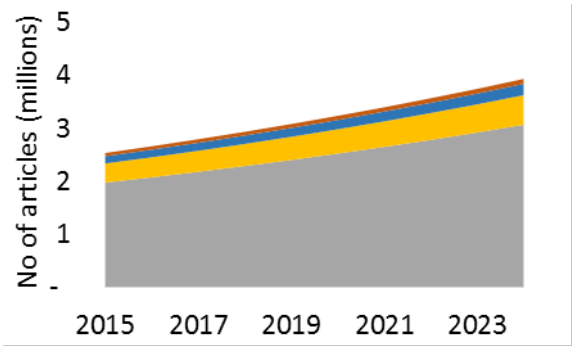


Scenario

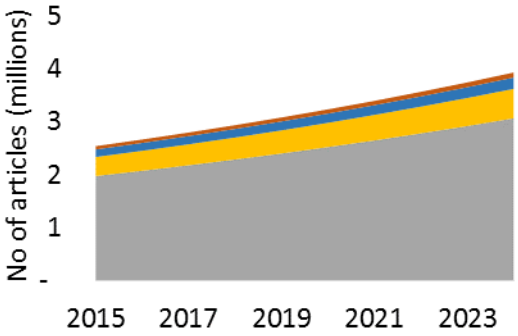


Article production - Rest of the World

Business as Usual

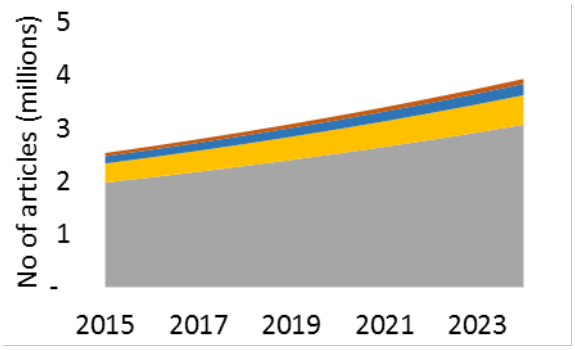


Scenario

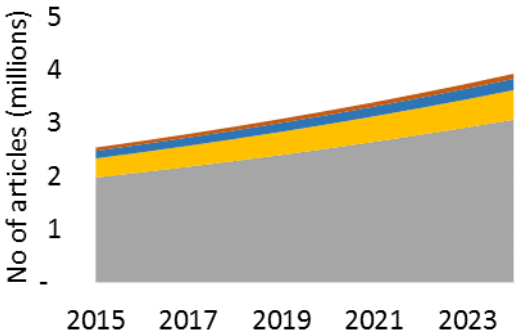


Article consumption - Switzerland

Business as Usual

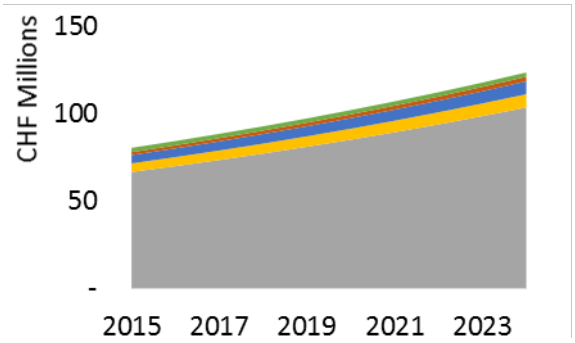


Scenario

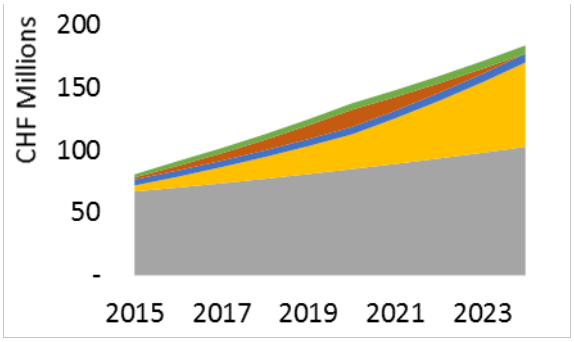


Funding requirement - Switzerland

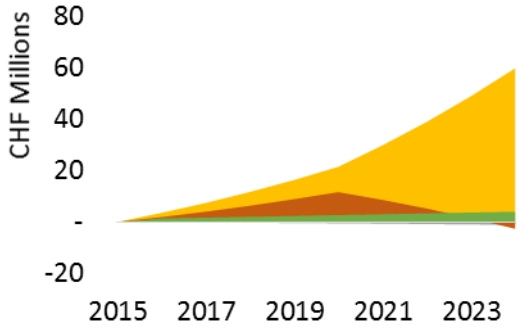
Business as Usual



Scenario



Net funding requirement



Funding requirement

	Total impact (CHF million)	**Annual impact** (CHF million)	**Impact** (% library funding)	**Impact** (% research funding)
Articles	301	30	29.8	0.31
Articles & books	466	47	62.9	0.48

Impact assessment

Average annual impact (CHF million)	**Average total impact** (% publication funding)	**Max annual impact** (CHF million)
0.96	0.46	12.88

Scenarios & uncertainty

		Average annual impact (CHF million)		
Scenario	**Inputs**	**Best case**	**Reference**	**Worst case**
APC increase	CHF 1,755	12	35	68
Sub. prices increase	CHF 35	22	33	46
World goes blue	50%	20	30	42
World goes gold	35%	12	18	27
World goes gold	50%	6	9	15
Double dipping	0%	20	30	43
Embargo increases	Two years	24	36	50
Fast track transition	2020	27	36	46

D.5. Blue + hybrid offset

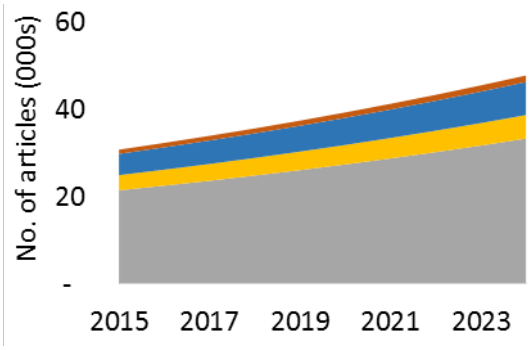
Blue + hybrid offset

Inputs

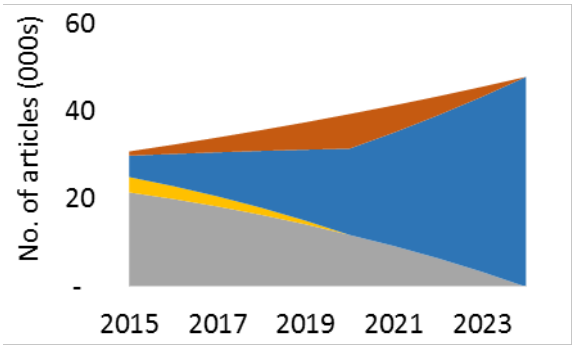
	Consumption	Production	Split 2015	Split 2024	Price (CHF)
Conventional	2,003,236	21,513	70%	0%	33
Gold	364,692	3,490	11%	0%	1,409
Blue	138,686	4,870	16%	100%	33
Hybrid + offset	61,638	972	3%	0%	1,755

Article production - Switzerland

Business as Usual

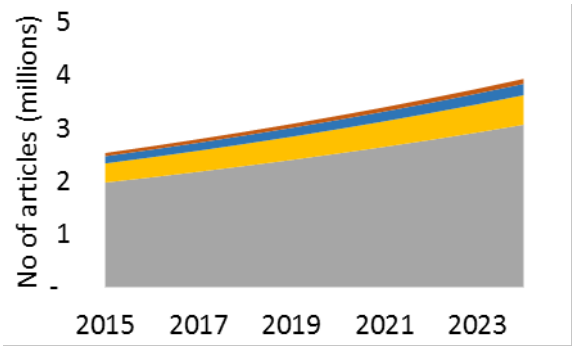


Scenario

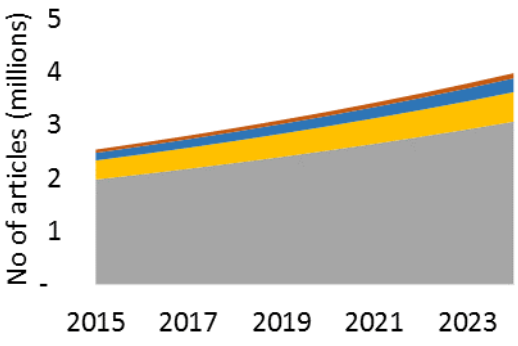


Article production - Rest of the World

Business as Usual

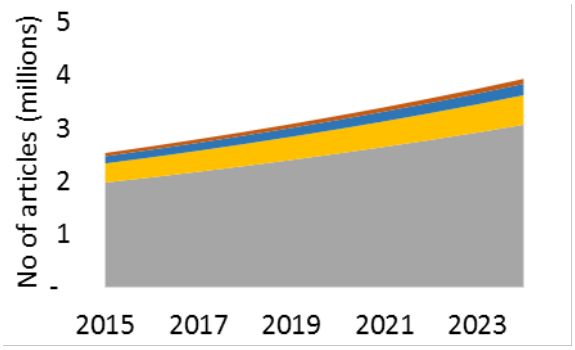


Scenario

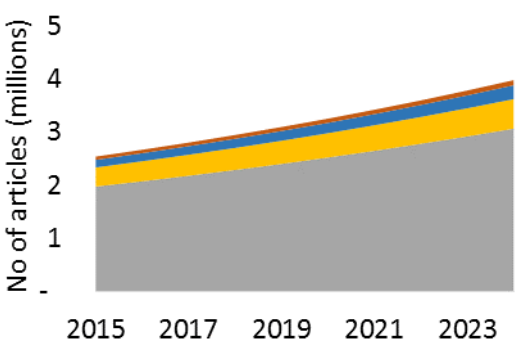


Article consumption - Switzerland

Business as Usual

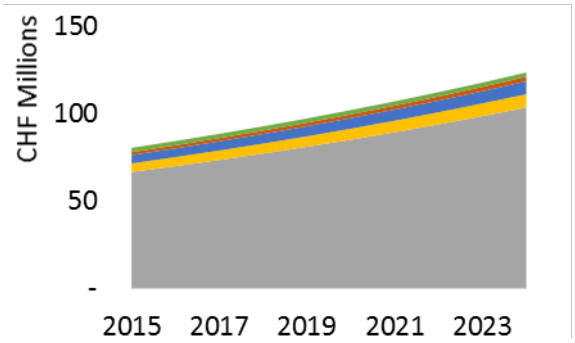


Scenario

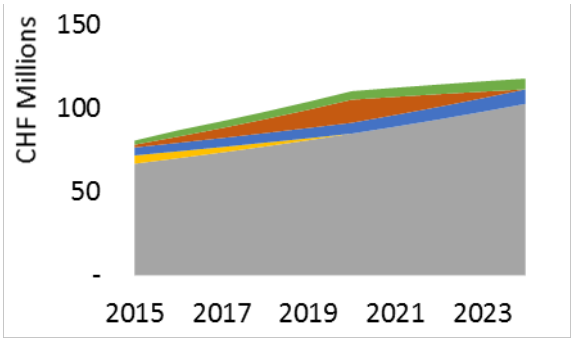


Funding requirement - Switzerland

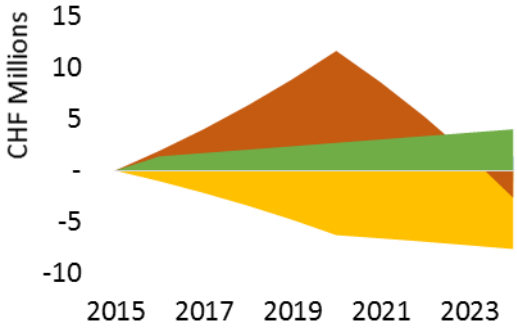
Business as Usual



Scenario



Net funding requirement



Funding requirement

	Total impact (CHF million)	**Annual impact** (CHF million)	**Impact** (% library funding)	**Impact** (% research funding)
Articles	24	2	2.4	0.02
Articles & books	31	3	3.7	0.03

Impact assessment

Average annual impact (CHF million)	**Average total impact** (% publication funding)	**Max annual impact** (CHF million)
0.08	0.07	1.35

Scenarios & uncertainty

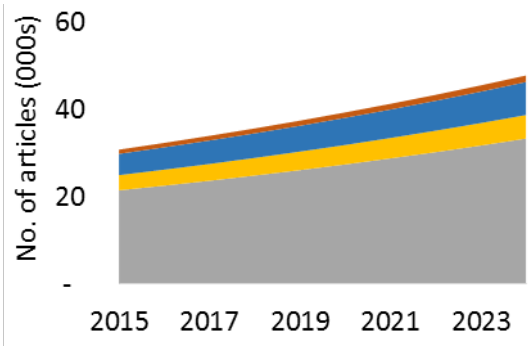
			Average annual impact (CHF million)	
Scenario	**Inputs**	**Best case**	**Reference**	**Worst case**
APC increase	CHF 1,755	0	2	6
Sub. prices increase	CHF 35	2	5	9
World goes blue	50%	0	2	5
World goes gold	35%	-8	-10	-10
World goes gold	50%	-14	-19	-22
Double dipping	0%	0	2	6
Embargo increases	Two years	5	8	14
Fast track transition	2020	-1	-4	-7

D.6. Mixed

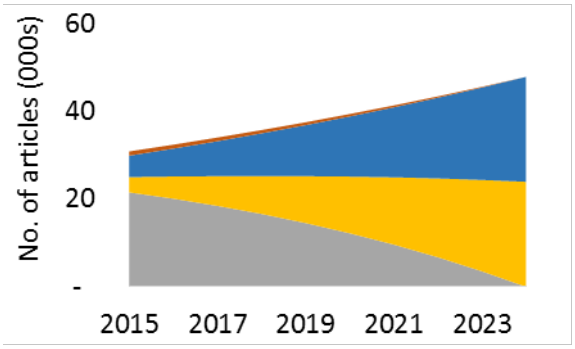
Mixed					
Inputs					
	Consumption	**Production**	**Split 2015**	**Split 2024**	**Price (CHF)**
Conventional	2,003,236	21,513	70%	0%	33
Gold	364,692	3,490	11%	50%	1,409
Blue	138,686	4,870	16%	50%	33
Hybrid + offset	61,638	972	3%	0%	1,755

Article production - Switzerland

Business as usual

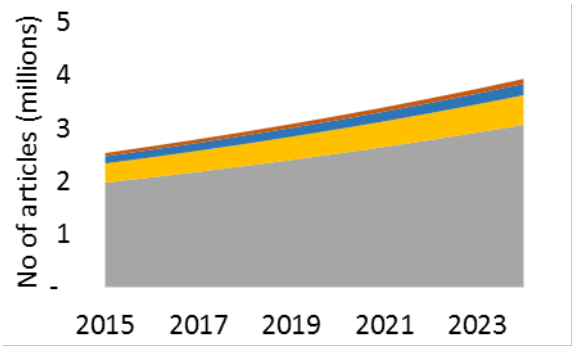


Scenario

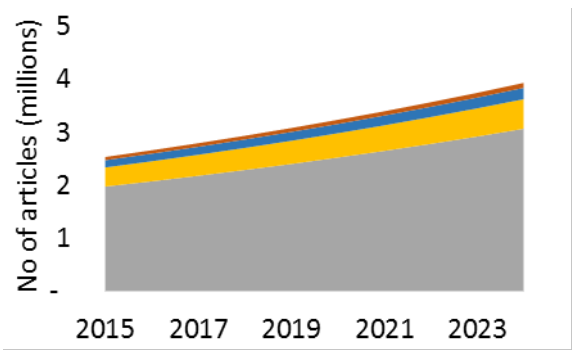


Article production - Rest of the World

Business as Usual

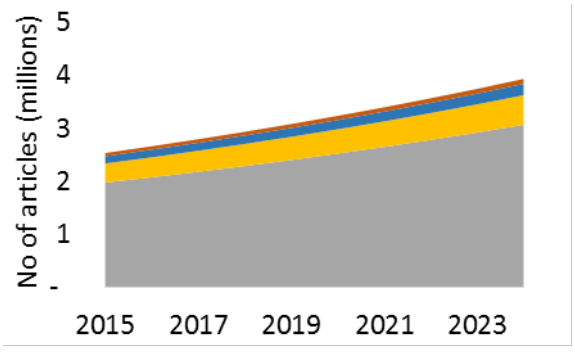


Scenario

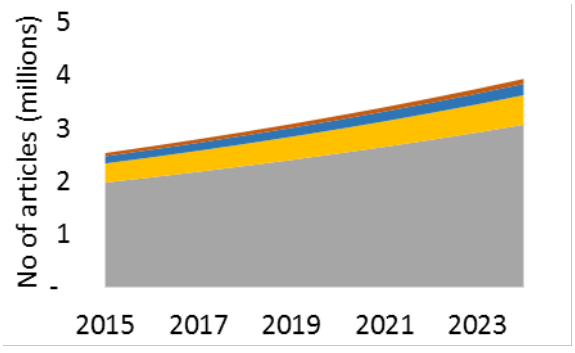


Article consumption - Switzerland

Business as Usual

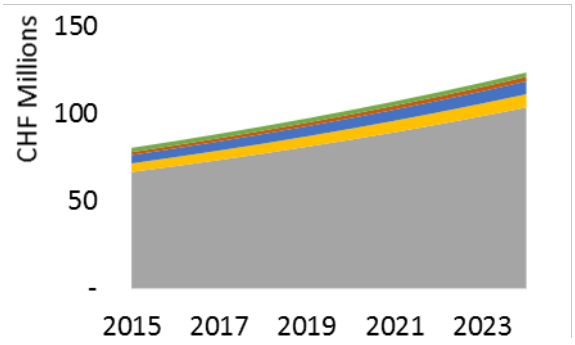


Scenario

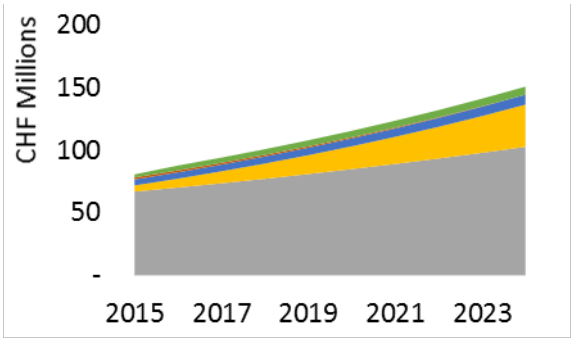


Funding requirement - Switzerland

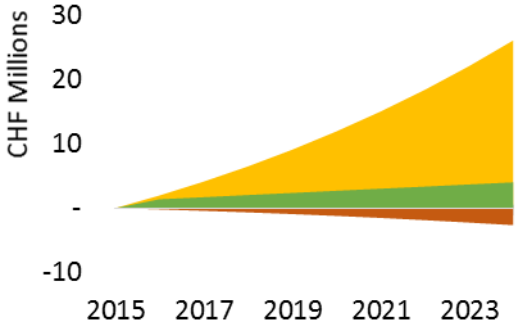
Business as Usual



Scenario



Net funding requirement



Funding requirement

	Total impact (CHF million)	**Annual impact** (CHF million)	**Impact** (% library funding)	**Impact** (% research funding)
Articles	125	13	12.4	0.13
Articles & books	175	18	22.3	0.18

Impact assessment

Average annual impact (CHF million)	**Average total impact** (% publication funding)	**Max annual impact** (CHF million)
0.40	0.16	6.40

Scenarios & uncertainty

		Average annual impact (CHF million)		
Scenario	**Inputs**	**Best case**	**Reference**	**Worst case**
APC increase	CHF 1,755	6	15	29
Sub. prices increase	CHF 35	12	15	18
World goes blue	50%	10	12	15
World goes gold	35%	2	1	-1
World goes gold	50%	-4	-8	-13
Double dipping	0%	10	13	15
Embargo increases	Two years	14	18	23
Fast track transition	2020	13	16	20

D.7. Mixed + hybrid offset

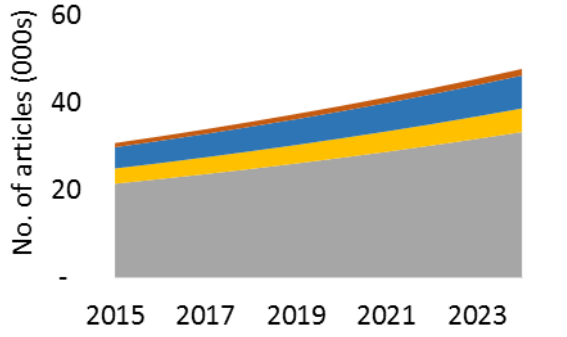
Mixed + hybrid offset

Inputs

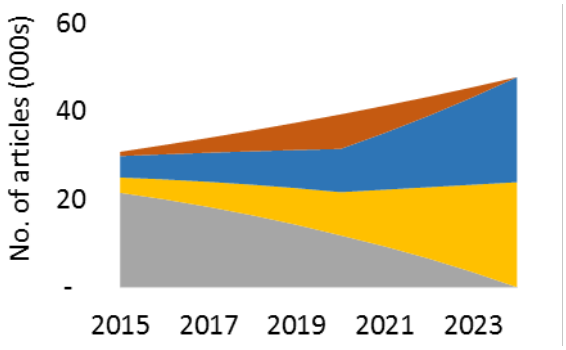
	Consumption	Production	Split 2015	Split 2024	Price (CHF)
Conventional	2,003,236	21,513	70%	0%	33
Gold	364,692	3,490	11%	50%	1,409
Blue	138,686	4,870	16%	50%	33
Hybrid + offset	61,638	972	3%	0%	1,755

Article production - Switzerland

Business as Usual

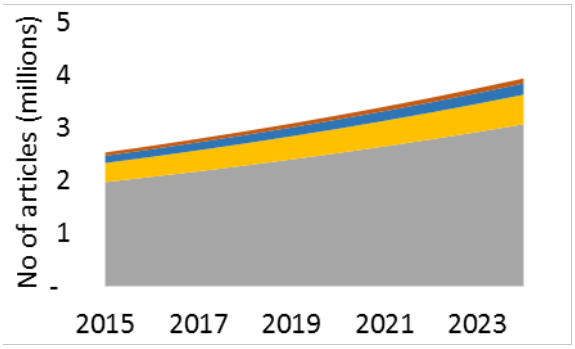


Scenario

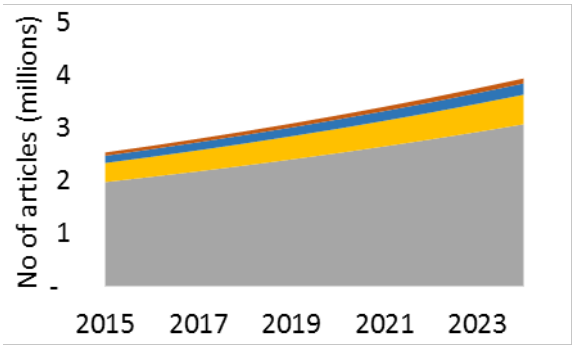


Article production - Rest of the World

Business as Usual

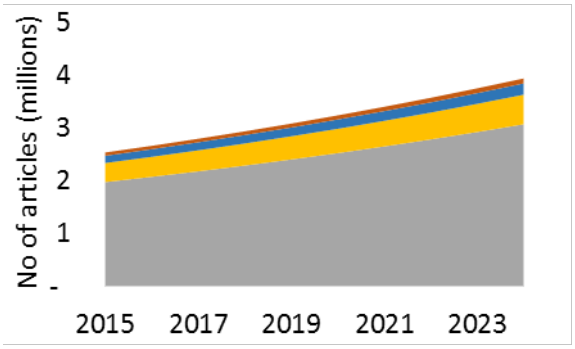


Scenario

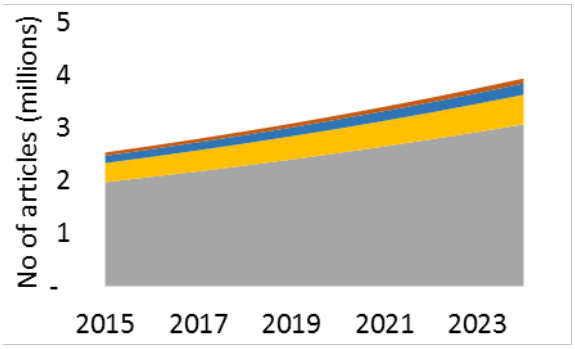


Article consumption - Switzerland

Business as Usual

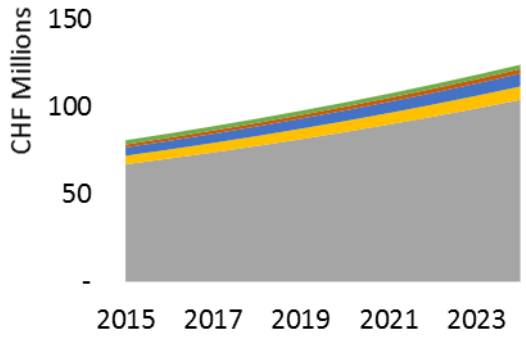


Scenario

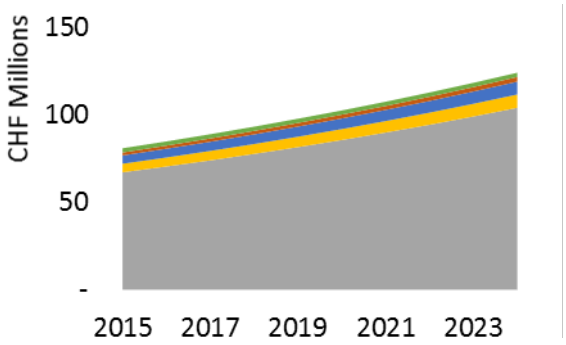


Funding requirement - Switzerland

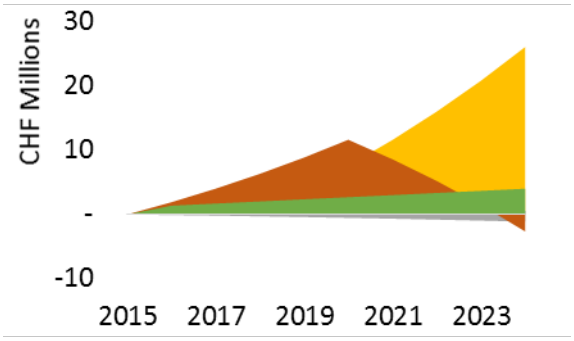
Business as Usual



Scenario



Net funding requirement



Funding requirement

	Total impact (CHF million)	**Annual impact** (CHF million)	**Impact** (% library funding)	**Impact** (% research funding)
Articles	162	16	16.1	0.17
Articles & books	248	25	33.3	0.26

Impact assessment

Average annual impact (CHF million)	**Average total impact** (% publication funding)	**Max annual impact** (CHF million)
0.52	0.26	5.65

Scenarios & uncertainty

		Average annual impact (CHF million)		
Scenario	**Inputs**	**Best case**	**Reference**	**Worst case**
APC increase	CHF 1,755	6	19	37
Sub. prices increase	CHF 35	12	19	27
World goes blue	50%	10	16	24
World goes gold	35%	2	4	8
World goes gold	50%	-4	-5	-4
Double dipping	0%	10	16	24
Embargo increases	Two years	14	22	32
Fast track transition	2020	13	16	20

ANNEX E SUMMARY OF FINDINGS – QUALITATIVE QUESTIONNAIRE

In this annex, we detail the findings from the qualitative questionnaire. We have kept the responses anonymised, with a focus on aggregated responses.

The qualitative questionnaire that was circulated included 39 questions. We have grouped these questions into four categories and provide a summary of findings. The four categories are:

- **OA policy**: what are the current policies regarding OA?
- **OA strategy**: what are the intentions of institutions with respect to OA?
- **OA infrastructure**: what resources and infrastructure exists for OA?
- **National Strategy**: what should be included within the National Strategy?

E.1. OA policy

E.1.1. Adoption

A majority (57%, 30 of 52) of institutions do not have an OA policy in place. This can be expected to change, as several libraries are planning to support OA. Some respondents note that the implementation measure of those OA policies lie within the competence of the funders. One respondent explains that the absence of OA policy is due to (1) an uncertain and fast-changing OA environment (2) risks on academic careers; (3) and risk of dismissing key non-OA publishers.

Table E1: Does your institution have an Open Access policy in place?

Answer	Statistics	Comments
Yes	42.55%	**Libraries:** Refer to OA policies **Funders:** Refer to OA policies
No	57.45%	**Libraries**: Planning to. **Funders:** No but some implementation measures are within the competence of the disciplinary platforms of the funder

E.1.2. Implementation

Many institutions (77%, 40 of 52) do not have a communication strategy for OA. Those that do, use various means (e.g. online and intranet news, mailing list, training or staff magazines). Nevertheless, a majority of institutions (56%, 29 of 52) either encourage or require green OA publishing and most generally encourage gold OA. For those that do not, traditional publishing channels are encouraged.

Table E2: Does your institution encourage or require authors to publish Open Access?

Answer	Statistics	Comments
Yes, authors are required to deposit in a repository (green OA)	17.9%	Authors are required to deposit in a repository and they are also encouraged to publish Gold OA.
Yes, authors are encouraged to deposit in a repository (green OA)	30.8%	Authors are also encouraged to publish Gold OA (both answers included)
Yes, authors are required to publish Gold OA	2.13%	
Yes, authors are encouraged to publish Gold OA	10.64%	
No	40.43%	Encouraged to publish through traditional channels.

E.1.3. Double dipping management

While the majority of institutions are aware of the issue of double dipping, most do not have mechanisms in place to deal with it. Those that do, library and funders typically, exclude hybrid OA offers from their funding. However, individual authors might still choose to pay for OA in a subscription journal and are not prohibited to do so.

Table E3: Is there any mechanism in place to deal with "double dipping" (paying for Gold-OA and at the same time for subscriptions)?

Answer	Statistics	Comments
Yes	12.8%	**Library / research institute / universities:** negotiations of e-resources through our CODUL consortium and the Swiss national consortium. Excludes "Hybrid OA" offers from funding.
No	71.8%	**Funders**: We are not directly concerned as the SNSF does not make research itself but funds OA research publications. In this context, the SNSF was always aware of the double dipping problem. In order to avoid supporting this, the SNSF does not support hybrid OA. Besides, the SNSF subscribes to fee-based scientific journals for its collaborators.
Not aware of the problem	15.4%	

E.1.4. Level of support

About half (48%, 25 of 52) of institutions support their researches in publishing in OA journals either financially, operationally (staff) or both. This depends however on the strategic relevance of the publication. Financial support is for gold OA. One respondent indicated that the library typically offers a contribution up to 2000 CHF per OA publication. The SNSF grant and may be charged to this grant up to a maximum amount of CHF 3,000 per OA article and CHF 12,000 for a basic digital book. In the context of the pilot project OAPEN-CH, the SNSF supports book publications from 5,000 up to 40,000 CHF.

E.1.5. Technical characteristics of policies

In terms of the specifics of OA policies, we can also note that:

- Half of the institutions consulted (50%, 26 of 52) offer guidelines on the procedure of OA publishing;
- The level of access for a publication can be chosen by authors and the degree varies across institutions;
- Most respondents (73%, 38 of 52) indicate that repositories do not have an embargo, but for those who do, embargoes are flexible. Universities/libraries can manage embargos, but do not generate embargos. The embargo is determined by editors or is negotiated by authors. The length of the embargo can typically be chosen.
- For those institutions that have a repository, stage is flexible and varies depending on the OA policy of the institution.
- There is typically a quality control stage at the depositing stage, though it varies between institutions.
- In terms of copyright, libraries typically check publications against the publisher's self-archiving guidelines and other potential copyright violations.
- The repository team generally (83%) do not ask the depositors back for manuscripts that are allowed to be Open Access at the end of the embargo period.

E.2. OA strategy

E.2.1. Adoption

An OA strategy has been adopted or in the process of been adopted by only part (61%, 30 of 52) of the respondents (funders, libraries and universities alike).

Table E4: Is Open Access part of the strategic objectives of your institution (or library)?

Answer	Statistics	Comments
Yes	61%	**Libraries**: Most have adopted or in the process of adopting an OA strategy. **Funders**: It is a mission of their organisation.

		Teaching/research institutes: For most, OA is part of strategic plan. For others, OA is only encouraged and the level of commitment remains low.
No	39%	No comments

E.2.2. Implementation

However, for some, OA is only encouraged and the level of commitment remains low. In fact, most institutions (86%, 45 of 52) haven't engaged in discussion with political authorities or requested funding for implementing this strategy. Only the SNSF has been launching the discussion on OA which led to a mandate by the State Secretary of Education, Research and Innovation (SERI) for a national strategy. Together with SUC P-2, SNSF is managing an analysis and survey on the financial flows in the publication sector to evaluate the opportunity and the costs of a transition to an OA system. Monitoring of the progress of the strategy is minimal. Few (7%, 14 of 52) organisations have access to statistics on OA publishing and the statistics available are often limited to the volume and type of publications.

Table E5: Is there data available for the monitoring of your Open Access strategy?

Answer	Statistics	Comments
Yes	7%	**Overall, number and type of publication** **Libraries:** Number of documents deposited in the repository, number of APCs paid in Gold OA **Funders:** Annual controlling **Research institute:** Number of documents deposited in the repository **Teaching/research institutes**: Some have minimal statistic depositing data sometimes with filters for faculties, institutes, publication types, year, names. Some have only statistics for Green OA.
No	93%	n/a

E.2.3. Motivation

Nevertheless, stakeholders are overwhelmingly (96%, 47 of 49) aware of the potential advantages that OA would bring. They argue that it would allow for a better dissemination of scientific findings and enhance visibility internationally as well as better use of public money. Only research funders see a disadvantage due of the potential redistribution of costs that would incur on them. They also highlight that it is not known if a movement to open access will reduce the financial burden of the overall system in Switzerland.

E.3. OA infrastructure

A majority of institutions (56%, 29 of 52) have an institutional repository, though most (85%, 44 of 52) don't have a subject repository. Interestingly, this is more than the number of institutions that have an OA policy in place. About half of the institutions have dedicated services or functions for Open Access and comments indicate that work is in progress for those that do not. On average, institutions have 2 FTE dedicated to services or functions for Open Access.

Respondents indicated that repositories serve equally for a number of reasons.

- to generate the publication part of the annual reports
- as a basis for evaluations of units of the institution
- allows researchers to generate their publication lists and to show these on the researchers' own websites
- offers detailed statistics about downloads and accesses, about numbers of citations and number/percentage of full texts and of Open Access

A large majority of institutions (94%, 49 of 52) do not have centrally operated OA journal platform or OA monograph platform. And few organisations (12%, 6 of 52) operate or refer researchers to a Digital Humanities platform. As regards to future infrastructure, while most respondents already have an OA infrastructure, for those who don't, several didn't know about this prospect. Some argue that the costs of a repository and the expertise needed exceed by far their resources and numbers of publication.

E.4. National Strategy

E.4.1. Expectations on National OA Strategy

Respondents' expectations are numerous but can be categorised as follows:

- Increased ease and security
- Increased information and solutions on cost and financing models
- Discussion and definition of the role of libraries and universities
- Progress in the area of copyright legislation
- Common Green Route Mandate
- A balanced and sustainable strategy that supports different routes to OA (Green, Gold, Hybrid, alternative publication models
- Several supported that a National OA strategy define common goals which are supported by all actors involved; development of a realistic plan for supporting the process for reaching these goals.
- A regulatory framework, good practices, recommendations in order to have constant practice OA and extended.
- A coordinated approach of key stakeholders (i.e. the Swiss government, SNSF, universities, research institutes, academic libraries and the Consortium of Swiss Academic Libraries)

- Concrete actions for the implementation of the strategy
- Consideration of the needs, reservation and fears of scientists
- Anticipation and be preparation for resistance against the implementation of a strategy (scientists, publishers, institutions)
- Address the “affordability problem” which was one of the main motivations of the Open Access movement in the first place. Recent “Open Access Big Deals” (e.g. Springer and VSNU in the Netherlands) bear the danger that the monopolistic power of a small group of commercial publishers will be just relocated into an Open Access environment.
- Assistance in launching an OA strategy/policy for smaller academic institutions
- Improvements in contact with stakeholders and better visibility internationally.
- Building a metasearch engine

ANNEX F LITERATURE REVIEW

In this annex, we provide a literature review based on similar studies to the work we are undertaking.

Description	Findings	Methodology
Max Planck Digital Library (2015) Disrupting the subscription journals' business model for the necessary large-scale transformation to open access	• The money already invested in the subscription system is sufficient to be redirected to gold OA. • The transition will impact research intensive institutions relative more. • Transition in the underlying business model can only be achieved on a global scale.	1. Calculate the publication cost per article under current state (subscription expenditure/number of articles) 2. Calculate the cost of APC per article. 3. Take the share of the articles produced within country. 4. Calculate total cost of OA publishing
STM (2015) Response to the MPDL White Paper on OA transition	STM indicate that the MPDL paper makes a number of assumptions that are not backed by the current data available and the experience of other institutions. • There is no consensus on adopting the Gold model, and gold OA models vary across disciplines • Research intensive institutions would be hard impacted. • APC of €2000 is too low. Hybrid OA are more selective therefore more expensive. In a 100% gold model, APCs would also need to cover the significant infrastructure costs currently sustained by subscriptions.	
Lawson, Gray and Mauri (2016) Opening the Black Box of Scholarly Communication Funding	It is currently difficult to evaluate the impacts of new models for funding academic research due to the complex network of financial flows between public bodies, higher educational institutions, research councils and publishers.	Propose a framework for mapping financial flows around scholarly communication. Three main flows: • Institutional income • Institutional expenditure (subscription) • Institutional expenditure (APC)
RIN (2015) Monitoring the transition to Open Access	Published accounts provide no evidence that OA has had any adverse impact on societies' publishing revenues and overall financial health.	Ex-ante analysis of the financial statements of learned societies.

Finch (2012) Accessibility, sustainability, excellence: how to expand	A significant shift to open access journals could be cost-neutral for the HE sector as a whole – although not necessarily for individual institutions. Estimate an additional cost of £50-60m a year in expenditure from the HE sector: £38m on publishing in open access journals, £10m on extensions to licences for the HE and health sectors and £3-5m on repositories, plus one-off transition costs of £5m. Calculations as to costs for the future depend on a series of assumptions as to • the pace of change towards open access publishing, and in particular the extent to which the UK is on average ahead of the rest of the world • the average level of APCs as more journals adopt the open access model • the number and proportion of articles with overseas as well as UK authors for which UK funders and institutions would be required to pay a full APC • the extent to which during the transition universities and other organisations are able to reduce their expenditure on subscriptions even as their expenditure on APCs rises. Much depends on how quickly the rest of the world moves towards open access.	**On publishing in OA journals**: calculate the numbers of articles published by UK authors and worldwide. Calculate average APC; Assumptions: The model assumes that the costs of subscriptions will fall in proportion to the increase in the number of articles published open access; it is likely, however, that during the transition to open access, universities and other organisations will maintain subscriptions even as their expenditure on APCs rises. Model is not dynamic and does not provide forecast in growth of articles. APC is assumed to be stable, however, there may be upward pressure on prices as open access becomes more widespread among prestigious journals with high rejection rates and thus higher costs. Nevertheless increase in competition may keep APC cost down. The Finch report also accounts for the high-proportion of articles published by UK authors which included also an author from overseas, and varying the proportion of UK-authored articles for which the full cost of the APC would be borne in the UK. **On depositing in repositories**: Most of the cost are already sunk therefore operating costs are modest.

Swan and Houghton (2012) Going for Gold?	Conclude that all institutions — even the most research-intensive — would save money from worldwide Gold OA as long as APCs were kept under £2000. Savings would be considerable if the APC were to be held at the current average, which is £571. Using green OA during the transition would be about 80% cheaper than the cost of gold OA. It is also found that research-intensive universities would see the greatest savings. Transitioning to Open Access, we have also modelled the cost impacts of an institution unilaterally. Under these conditions, all universities would face additional costs for Gold OA publishing charges, and the more research-intensive universities would face higher costs. As publication charges rise, these costs become substantial, and may in some case exceed current subscription costs.	The model explores the various scenarios under the assumption of: (i) worldwide Open Access (i.e. where the alternative model explored is assumed to be universally in place), and (ii) unilateral Open Access (i.e. where the alternative model is adopted by the institution alone, all else remaining the same). The latter is intended to shed light on the issue of transitioning to Open Access.
JISC (2009) Economic Implications of Alternative Scholarly Publishing Models	Summing the costs of production, publishing and dissemination per article in electronic-only format suggests that average toll access publishing system costs would amount to around £8,296 per article, average open access publishing costs to £7,483 per article and average open access self-archiving costs £7,115 per article. For UK higher education, these journal article cost differences would have	This study focuses on three alternative models for scholarly publishing, namely: subscription publishing, open access publishing and self-archiving.

	amounted to savings of around £80 million per annum circa 2007 from a shift from subscription access to open access publishing, and £116 million from a shift from subscription access to open access self-archiving with overlay services. In addition to direct cost differences, there are potential system cost savings. However, the cost savings alone are likely to be sufficient to pay for open access journal publishing or self-archiving, independent of any possible increase in returns to R&D that might arise from enhanced access. Thus, it seems possible that open access publishing alternatives could be supported from within existing budgetary allocations.	
Houghton (2012) The costs and benefits of Open Access in Germany for the DfG	Modelling the impacts of an increase in accessibility and efficiency resulting from more open access on returns to R&D over a 20 year period and then comparing costs and benefits, the authors find that the benefits of open access publishing models are likely to substantially outweigh the costs and, while smaller, the benefits of the German NLP also exceed the costs. Green Open Access in parallel with the traditional model yields the best benefits/cost ratio but the sustainability of this arrangement is debatable.	

Curry (2012) Key Questions for Open Access Policy in the UK	Harnad and Suber have both expressed the fear that the policy is a gift to publishers because they could simply extend their green OA embargo period to beyond 6 months in order to oblige authors to pay gold OA APCs to comply with the RCUK stipulations. The temptation to adopt this stratagem seems irresistible; it makes good business sense, especially for journals that trade on their impact factors. The policy could therefore simultaneously inhibit the spread of green OA options and lead to hikes in APCs. Suber also points out that journals that currently offer free gold OA publishing will be induced by the new RCUK policy to start charging. These are perverse outcomes for a policy designed to promote open access.	Swan sees a threat to costs from another direction, arguing that RCUK's preference for gold over green OA favours the status quo by protecting the income streams of publishers and so inhibiting the entry to the market of publishing innovators who are likely to offer better value for money.

ANNEX G BOOK PUBLISHING

G.1. Introduction

In the body of the report, we focus on article production rather than on books and articles together. We prefer to focus on articles, as:

- The physical and financial data we have on book publishing at the Swiss level and at the Global level is less robust than on articles and as such, we do not want to detract from the information we have available on articles.
- The policy taken towards OA on books does not necessarily need to be the same as the approach taken on articles. The context is different and the publishing models can be quite different.

However, book publishing should not be ignored as it does have its own costs. In this annex, we have tried to present information from the main body of the report to provide an indication of how the figures may change with the inclusion of books and articles. The figures presented are indicative and so less weight should be placed on these findings.

G.2. Results from the inclusion of books

G.2.1. Current financial flows including books (section 5.1)

Table G.1 gives a picture of the current financial and physical flows accounting for books subscription and publishing. The results presented are however to be used with careful consideration. Data on book publishing is scarcer than on articles and we have had to make a number of assumptions to obtain those results.

We can observe that altogether, there were close to CHF 109 million in Switzerland to support the consumption and production of academic research in 2015. A large majority of it (93%) went towards consumption of (buying access to) journals and books. While the remaining (7%) supported Swiss researchers publish their work.

Books account for a little less than a third of subscription expenditure (29%) and a little more than a third of publication expenditure (38%). Library data suggests that the penetration of OA is much stronger in book publishing as opposed to article publishing. As the volume of scientific research (row 7) in Table G.1 indicates, 11% and 16% of Swiss article production are gold and blue respectively but 17% and 34% of books published by Swiss institutions are Gold and Blue OA according to the data we have available.

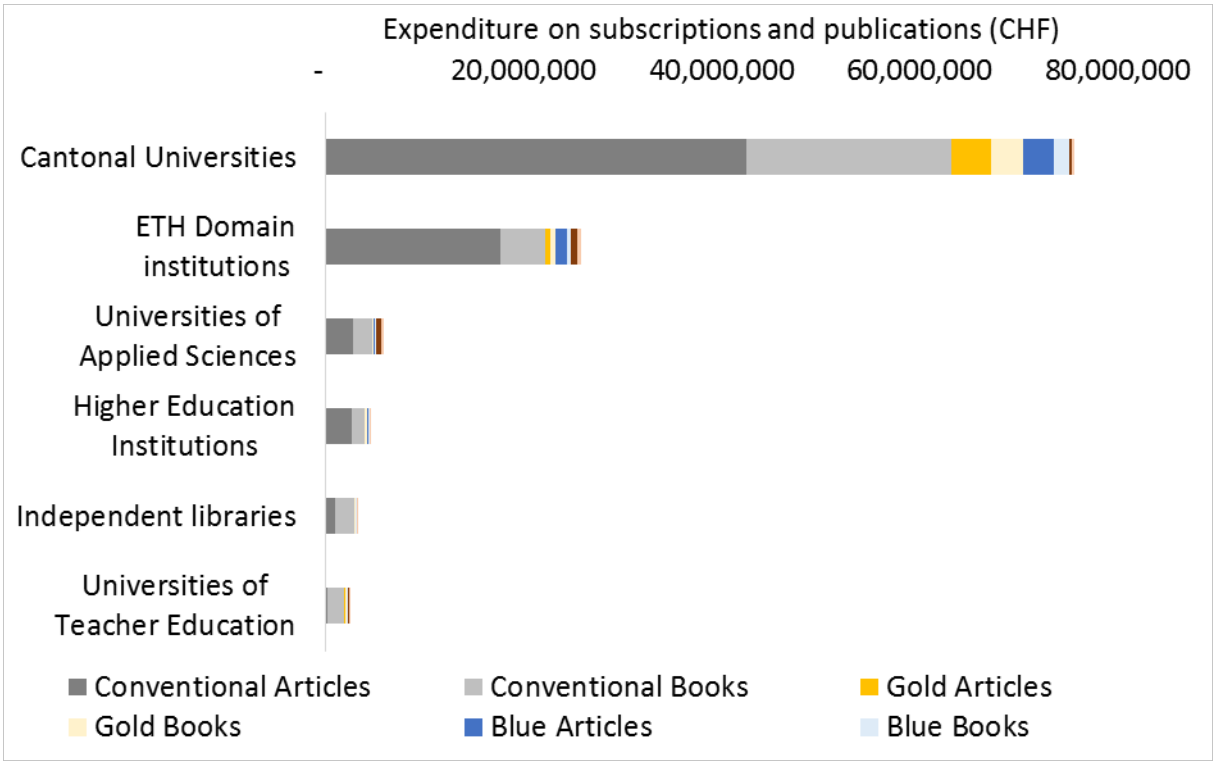
Table G.1: Current map including books

		Articles	Books	Total	
1	Research, publications, teaching, subscriptions, others			CHF 9.6 billion	
2	Expenditure on subscriptions and publications	CHF 77 million	CHF 39 million	CHF 115 million	
3	Expenditure on subscriptions	CHF 67 million	CHF 32 million	CHF 99 million	
4	Volume subscribed	2,568,251	114,011		
	Conventional	2,003,236	88,929	78%	77%
	Gold	364,692	16,190	14%	15%
	Blue	138,686	6,157	6%	6%
	Hybrid	61,638	2,736	2%	2%
5	Volume Produced by Rest of the World	2,537,407	112,251		
	Conventional	1,981,723	88,087	78%	78%
	Gold	361,202	15,894	14%	14%
	Blue	133,815	5,565	5%	5%
	Hybrid	60,666	2,705	2%	2%
6	Expenditure on publications	CHF 5 million	CHF 3 million	CHF 8 million	
7	Volume Produced by Switzerland	30,844	1,760		
	Conventional	21,513	841	70%	48%
	Gold	3,490	296	11%	17%
	Blue	4,870	592	16%	34%
	Hybrid	972	31	3%	2%

G.3. Current financial map at the disaggregated level (section 5.2)

In this sub-section, we provide expenditure figures for the different types of institutions that includes both articles and books.

Figure G.1: Total expenditure on publications and subscriptions broken down by types of institutions



Source: CEPA

G.4. Future funding impacts (section 6.2)

When considering book publishing, we observe that the impact across models remains similar to when looking at articles: Blue OA is the most cost effective model while Gold OA with hybrid the most costly to adopt. However, book publishing yields greater benefit than article publishing. This is because library data suggests that the penetration of OA is stronger for books compared to articles.

Table G.2: Funding requirement for the baseline scenario and reference sensitivity, books only 2015-24

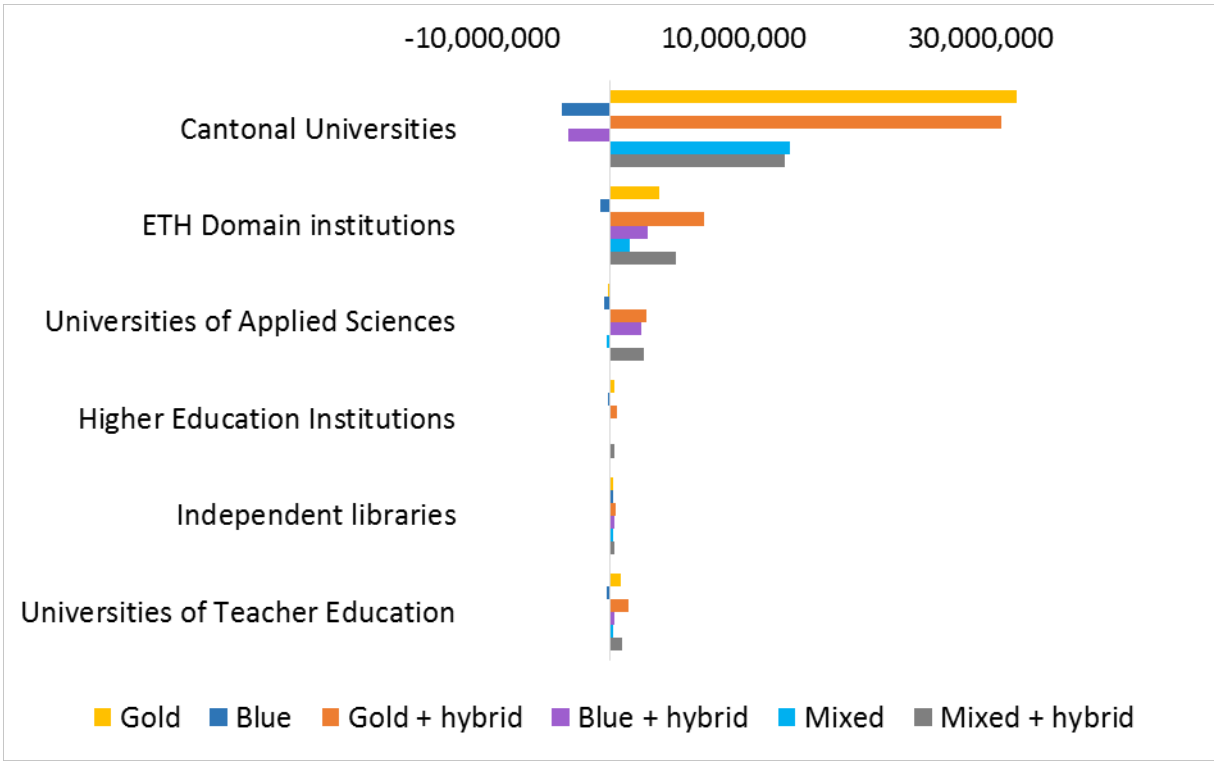
OA model	Total impact (CHF million)	Annual impact (CHF million)	Total impact (% publication funding)	Total impact (% research funding)
Blue	-34	-3.4	-6.7%	-0.03%
Blue + hybrid	7	0.7	1.3%	0.01%
Mixed Gold & Blue	50	5.0	9.9%	0.05%
Mixed Gold & Blue + hybrid	86	8.6	17.2%	0.09%
Gold	133	13.3	26.6%	0.14%
Gold + hybrid	165	16.5	33.1%	0.17%

Table G.3: Funding requirement for the baseline scenario and reference sensitivity, books and articles combined 2015-24

OA model	Total impact (CHF million)	Annual impact (CHF million)	Total impact (% publication funding)	Total impact (% research funding)
Blue	-57	-5.7	-9.0%	-0.05%
Blue + hybrid	27	2.7	3.3%	0.03%
Mixed Gold & Blue	170	17	22.1%	0.17%
Mixed Gold & Blue + hybrid	243	24.3	33.1%	0.25%
Gold	397	39.7	53.4%	0.41%
Gold + hybrid	459	45.9	62.9%	0.47%

G.5. Distributional impacts on future funding (section 6.2)

Figure G.3: Total impact by types of institutions across models accounting for both articles and books (in CHF)



Source: CEPA