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Turning climate-related information into added value for traditional **MED**iterranean **G**rape, **OL**ive and **D**urum wheat food systems

Deliverable 7.2

Data Management Plan



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Executive Summary

The MED-GOLD Data Management Plan defines how data used or produced within the project will be treated, archived, disseminated and maintained by project partners and how the data will be shared with the wider community. DMP is a live document that will be regularly updated whenever new assumptions on data, used or produced by the project, are emerging.

With this deliverable, the project has contributed to the achievement of the following objectives (DOA, Part B Table 1.1):

No.	Objective	Yes
1	To co-design, co-develop, test, and assess the added value of proof-of-concept climate services for olive, grape, and durum wheat	Y
2	To refine, validate, and upscale the three pilot services with the wider European and global user communities for olive, grape, and durum wheat	Y
3	To ensure replicability of MED-GOLD climate services in other crops/climates (e.g., coffee) and to establish links to policy making globally	Y
4	To implement a comprehensive communication and commercialization plan for MED-GOLD climate services to enhance market uptake	Y
5	To build better informed and connected end-user communities for the global olive oil, wine, and pasta food systems and related policy making	Y

1 INTRODUCTION

The MED-GOLD project aims to develop climate services for olive, grape, and durum wheat crop systems that are the basis for producing olive oil, wine and pasta.

The MED-GOLD Data Management Plan (DMP) regulation is derived from a set of rules based on the ongoing directives for the [H2020 Research Programme which are established following its specific framework of reference on data and information regulation](#). An open access to H2020 project data, documents, deliverables, scientific reports and publications in peer reviewed journals represents the fundamental leverage to provide and produce direct and indirect benefits of the H2020 Research program on society. The major goal of these guidelines is to ensure that results and scientific products coming from the project are as open and accessible as possible, not only from project web portals, but also through specific dissemination infrastructures such as [ZENODO](#) and [OpenAIRE](#). Thus MED-GOLD has to developed a DMP as a project funded by H2020 Programme. Furthermore DMP will help MED-GOLD partners to manage H2020 directives on scientific data in a more effective way by clarify any doubt regarding policies and good practices for data gathering, distribution or dissemination.

This H2020 approach to the scientific process of knowledge dissemination tends to maximize its diffusion in all phases of scientific practice, which is usually focused on the publication of results at the end of the process.

“Open access to scientific information is a cornerstone of a modern Open Science system. Most EU Member States now have open access policies in place but the situation across the EU varies. This revised Recommendation provides very powerful guidance to the Member States so that they can reach their goal of transition to immediate open access as the default by 2020.” (Carlos Moedas, Commissioner for Research, Science and Innovation).

An interesting overview explaining the complex ecosystem of Open Data, Open Software and Open access, especially for environmental studies, is provided by [Wheeler and MacMillan \(2018\)](#).

Recently, the EC updated some [rules](#) providing a more comprehensive and complete description of the Open Science concept which is one of the three pillars of the [Open Innovation Policy](#), along with two other pillars: Open Innovation and Open to the world. The MED-GOLD project, by adopting those directives of Open Science, will contribute and promote this process of transition towards the Open Science vision, whenever possible. These principles are fundamental and are already present within the framework of climate services where the interaction between the scientific community and operational and

stakeholder communities, both commercial and institutional, is present and thus relevant for MED-GOLD activities.

Up to now there is only an initial setting and design of climate service prototypes data flow. For this reason only in a future update of this document it will be possible to define a stable and unique design of MED-GOLD data flow connecting who is producing information to whom is using it.

For its specific purpose DMP is a live document that will be updated and specified progressively along the MED-GOLD project lifespan. As planned, this second version of this document represents an updated version due to the project activities development, suggestions provided by project reviewers. A review of DMP is planned for November 2019.

2 Data summary

MED-GOLD would produce climate services in the agricultural sector by developing case studies for three hallmarks of the Mediterranean food system: grapes, olives and durum wheat. Developing a capacity to turn the increasingly big climate-related data into tailored climate services that can inform decision-making in agriculture, is therefore a priority both in Europe and worldwide.

A key challenge is to co-design prototype pilot service applications involving both suppliers and users in the three major traditional Mediterranean crop systems so as to demonstrate the added-value of data/information-driven responses to changes in the climate system. The operational decision-making of users will be reviewed to either identify key decisions or introduce new actions that can benefit from climate-related information at different timescales from months to decades.

As a general assumption, research data refers to: "information, in particular facts or numbers collected, to be examined and considered as a basis for reasoning, discussion, or calculation" (H2020 [Guidelines](#) 1). Research data can more generally be defined as: "the recorded factual material commonly accepted in the scientific community as necessary to validate research findings" ([OMB Circular A-110](#)). In addition to the other records to manage, it may not be possible to share certain data owing to the nature of the records themselves, or for ethical and privacy concerns. Examples of research data are: preliminary analyses, drafts of scientific papers, plans for future research, peer reviews, and communications with colleagues ([OMB Circular A-110](#)).

MED-GOLD research activities need a wide range of data types: essential climate variables, modelled gridded data variables, observational data, remote sensed estimates to build specific information and services to support the decision making processes through

prototype pilot applications. Such a variety of data is necessary to produce tailored information which could be used directly by decision makers and stakeholders for their activities. The MED-GOLD project team defined a number of data categories commonly identified with these labels: raw data; processed data; generated data; personal data; qualitative data (collected during workshops), publications; these six categories are discussed in more detail below. A reference scheme has been established for any publication and documentation used or produced in the MED-GOLD project along with the sharing rules adopted for brand new objects/products such as computed datasets, communication elements, software. All datasets, documents and software tools used for Med-Gold activities will follow their own original licencing scheme. The following scheme summarized these rules:

<i>Objects Generated by Med-GOLD</i>	<i>Access Type</i>	<i>Reference Licence Scheme Solution</i>
	MGs	<i>Med-Gold Grant and Consortium Agreements</i>
DATASETS	TPs	<i>Med-Gold Grant and Consortium Agreements</i>
	Private	<i>Restricted access managed by specific rules</i>
	Public	<i>Creative Commons Licence scheme (CC BY, CC SA or CC ND)</i>
	MGs	<i>Med-Gold Grant and Consortium Agreements</i>
COMMUNICATION PRODUCTS	TPs	<i>Med-Gold Grant and Consortium Agreements</i>
	Public	<i>Creative Commons Licence scheme (CC BY, CC SA or CC ND)</i>
	MGs	<i>Med-Gold Grant Agreement</i>
SOFTWARE, SCRIPT, LIBRARY, PACKAGE	TPs	<i>Med-Gold Grant Agreement</i>
	Private	<i>Non open source code with a restricted access managed by specific rules</i>
	Public	<i>Open source schemes (such as GNU General Public Licence, European Union Public Licence, etc)</i>

Table: Access Type and Licence Schemes where Med-Gold Partners (**MGs**), Third Parties (**TPs**), Everyone (**Public**).

As a general rule public dataset used as input information for algorithms, models and estimates, will remain public, following the initial licence scheme; the same approach will be adopted for open source software. For each element, data or information, it will be identified

a responsible person who will be in charge to act as a reference point for project partners, and to check if all the additional information, licences scheme included, are properly provided. To upload brand new elements, both data and information in the MED-GOLD platform it would be asked to identify a sharing rule. At the end of the project sharing policy of data, software and information generated in the framework of MED-GOLD will be specifically decided and identified in order to guarantee a final sharing rule.

Each data purveyor will be specifically responsible for data upload on the public and MED-GOLD repositories along with their update. An up to date list of datasets, software and publications produced is provided in Annex B.

All these assumptions and sharing strategies will be revised regularly, along the project timespan, on a yearly basis.

2.1 Raw data

Raw data represent basic data which are needed to start any project activity. These data are generally input data that can originate within large public access data repositories and portals, and are distributed according to an open access licence. **Climate data, both observed or modelled**, are a typical example of raw data, as long as crop estimates. An initial list of data sets identified as raw data are shown in Appendix A that will continuously update as new data will be identified for MED-GOLD from Partners in their activities and services.

Dataset Name	Coverage	highest Spatial resolution	Highest Time resolution	Data periods	Variables	WEB LINK	CITATION	NOTES
C3S Multi-model seasonal forecast	Global	1 degree	6-hourly	1993-2018		http://climate.copernicus.eu/seasonal-forecasts		3 models (ECMWF, Meteo-France, UK Met Office, CMCC)
ECMWF SEA5	Global	~ 36 km	hourly	1981-2018				

Table: An extract from Annex A, specifically the “Section 6: SEASONAL FORECAST”

To date in the MED-GOLD ICT Platform 8 raw input datasets have been uploaded and accessible:

Name of the Dataset	Brief Description	Object	Produced mainly by	Date	Access Type	Reference Licence Scheme solution	NOTES	OPEN dataset link	Reference WP	Licence Direct Link
E-OBS	This service provides climate mon	DATASET	EXTERNAL		Public	OTHER	The ECA&D/E-OBS data policy applies. These observational data are strict	http://surfobs.clim	OTHER	https://www.ecad
ERA-5	The ERA5 dataset contains one	DATASET	EXTERNAL		Public	OTHER	Copernicus data are provided free of charge to users. However, each data	https://www.ecmwf	OTHER	https://cds.climate
C3S Seasonal Forecasts	The C3S provides a multi-system	DATASET	EXTERNAL		Public	OTHER	Copernicus data are provided free of charge to users. However, each data	https://cds.climate	OTHER	https://cds.climate
AgMERRA	AgMERRA: Climate Forcing Data	DATASET	EXTERNAL		Public	OTHER	These datasets are provided "as is", and careful application of these data	https://data.giss.n	OTHER	
EURO-CORDEX	The Coordinated Regional climate	DATASET	EXTERNAL		Public	OTHER	The EURO-CORDEX dataset can be used for both data for non-comm	https://www.euro-c	OTHER	http://is-enes-da
EURO-CORDEX bias corrected	Bias corrected daily data for maxir	DATASET	NOA		Public	NONE			OTHER	
ECMWF System 5	The ECMWF System 5 is the 5th i	DATASET	EXTERNAL		Public	OTHER	Copernicus data are provided free of charge to users. However, each data	https://cds.climate	OTHER	https://cds.climate
ECMWF System 5 bias corrected	Bias corrected monthly data for m	DATASET	BSC		Public	CC BY	The bias corrected data from ECMWF System 5 for WP2 can be accessed in the MEDGOLD		OTHER	

Table: The summary information of public available datasets which have been uploaded into the ICT Platform [from Annex B].

These datasets, which are ready to be downloaded by MED-GOLD partners through the ICT platform, are provided under their original licences. A detailed description of these data are available in the Annex B.

2.2 Processed data

Processed data are raw data that were modified from the source to be used as input for the project models, algorithms, methods or other types of information-making processes. This type of data is thus often an output of algorithms. As an example: climatic indices such as degree days or drought indices computed respectively from daily surface air temperature and observed precipitation (the raw data cited in the 2.1) could be examples of processed data. This type of data follows the original access rules stated for their original data sources.

2.3 Generated data

Generated data represent all the outputs from the project activities which are used for deliverables, reports and any type of publications. Analysis coming from raw and processed data, computed data from models (i.e. crop models) feeded from raw and processed data should be considered "generated data". The main distinctions between processed and generated data are regarding the generation process: if it is based on the application of an algorithm, then data should be considered as processed. If the generation is based on a model (a computational system made by sequence of algorithms, assumptions, choices) then data should be considered as generated. Following the examples mentioned in the previous paragraphs estimated yields or harvest dates based on the degree days and drought indices could be representative of generated data types. When generated data are made accessible, to partners and to the public, it will be identified a sharing licensing rule, a reference person, a storage strategy (through the MED-GOLD platform or through other public available repositories) and a set of metadata for ensure an effective descriptive information. In the future updated versions of this document we will check if these settings might be revised. Among generated data it should be mentioned also private data which have a restricted access ruled by specific licence scheme that define their terms of use and conditions.

2.4 Personal data

Personal data are: "any information relating to an identifiable person who can be directly or indirectly identified in particular by reference to an identifier". Data obtained during the

workshops, focus groups and interviews and any other activities of the project regarding personal information collected from both MED-GOLD partners and invited people or institution representatives.

A brand new regulation on personal data, General Data Protection Regulation (GDPR), has been adopted by the end of May 2018. MED-GOLD will collect, use, manage and storage personal data according to the principles of GDPR ([General Data Protection Regulation](#)).

2.5 Qualitative data

A valuable amount of qualitative data were collected during workshops from surveys and notes computed with stakeholders regarding users needs, users visualization feedback which are at the basis of the co-develop and co-design processes of the pilot services. These data, are collected, digitized and, are archived anonymously in a shared cloud folder with access restricted only to the member of the consortium, to preserve the full information content without any personal references. These data will be used for MED-GOLD internal activities.

2.6 Publications

Publications refers to all forms of published research output such as: peer-reviewed primary research articles in academic journals, books of scholarship, chapters in scholarly books, refereed full-length or non-refereed papers in conference proceedings, technical reports, Data Management Plan, Communication and Dissemination Plan and other deliverables produced by MED-GOLD. In Appendix B a list of public available documents is provided.

3 FAIR Data

3.1 FAIR Guiding Principles

As reported in the paper *The FAIR Guiding Principles for scientific data management and stewardship* (Wilkinson et al., 2016) “There is an urgent need to improve the infrastructure supporting the reuse of scholarly data” thus highlighting the necessity of supporting discovery through good data management. This FAIR principles are summarised in the following scheme, followed by a more detailed description of each principle.

TO BE FINDABLE:

F1. (meta)data are assigned a globally unique and eternally persistent identifier.

F2. data are described with rich metadata.

F3. (meta)data are registered or indexed in a searchable resource.

F4. metadata specify the data identifier.

TO BE ACCESSIBLE:

A1 (meta)data are retrievable by their identifier using a standardized communications protocol.

A1.1 the protocol is open, free, and universally implementable.

A1.2 the protocol allows for an authentication and authorization procedure, where necessary.

A2 (meta)data are accessible, even when the data are no longer available.

TO BE INTEROPERABLE:

I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.

I2. (meta)data use vocabularies that follow FAIR principles.

I3. (meta)data include qualified references to other (meta)data.

TO BE RE-USABLE:

R1. meta(data) have a plurality of accurate and relevant attributes.

R1.1. (meta)data are released with a clear and accessible data usage license.

R1.2. (meta)data are associated with their provenance.

R1.3. (meta)data meet domain-relevant community standards.

[FAIR PRINCIPLES WORKING DETAILED DOCUMENT](#)

As an example a series of information, such as: description, short name, long name, data author, data maintainer, data of creation, data of revision, dissemination licence, are all typical metadata needed to be FAIR principles compliant. This selection of metadata choice is planned to be discussed and further developed in the future DMP updates along with a cooperative effort with other project partners involved in the ICT development.

3.2 Findable Data

Datasets generated by MED-GOLD will be made available in an open access mode in order to provide a full and wide access. In order to satisfy the COMMISSION RECOMMENDATION of 25.4.2018 “On access to and preservation of scientific information” and EC Guidelines on FAIR data management in H2020 ([original document](#)), all MED-GOLD data will be collected and categorized in the database archive system using a unified identifier. Furthermore each dataset within this database will be archived with a specific metadata information where original information are stored along with their specific licence scheme. Adopting objective identifier will guarantee that each type of data used during the project activities could be findable and traced clearly and easily. MED-GOLD will foster the adoption of a Digital Object Identifier (DOI) non-commercial and science oriented version for those scientific products that have a relevance as qualified information and with a large potential interest among the scientific and stakeholders community.

As a general rule, data generated within MED-GOLD will conform to best practices and standards in order to be compliant with FAIR principles.

3.3 Accessible and Reusable data

Following the *Guidelines on the Implementation of Open Access to Scientific Publications and Research Data in Projects supported by the European Research Council under Horizon 2020*, **Open Access** (OA) refers to the practice of providing online access to scientific information that is free of charge to the end-user and reusable; **'Scientific'** refers to all academic disciplines. In the context of research and innovation, 'scientific information' can mean: peer-reviewed scientific research articles (published in scholarly journals), or research data (data underlying publications, curated data and/or raw data).

In order to guarantee a fruitful respect of dissemination rules regarding data and information used and produced by the MED-GOLD project a Creative Commons-like licence policy will be adopted. There are several types of CC licences. The licences differ by several combinations that condition the terms of distribution. The MED-GOLD project will use a **CC-BY** type of licence. *This licence lets others distribute, remix, tweak, and build upon your work, even commercially, as long as they credit you for the original creation. This is the*

most accommodating of licences offered. Recommended for maximum dissemination and use of licenced materials. (See a full description [here](#)).

A larger part of data used and produced in the MED-GOLD project will be based on an open access approach, but case by case decision will be adopted. Furthermore in order to secure a freely access of data, software and information among a wide audience, guaranteeing at the same time to follow FAIR principles, it will be decided how to use specific open science platforms such as [ZENODO](#) or [OpenAIRE](#). It should be highlighted that these solutions represents valid options for data, software and documentation in a final and consolidated version, ready for a wider dissemination out of the MED-GOLD project borders: partners and selected stakeholders as stated by the Consortium Agreement. Datasets, software and documentation produced and exchanged during the development of activities among partners will be managed as described in the Med-Gold Grant and Consortium Agreement and specified in more details in ANNEX B of the present document.

A limited amount of raw data that are needed in the project come from private companies. These data have some specific limitations on their reuse and dissemination. These confidential terms of data usability limits their usage and dissemination among the MED-GOLD partners. For this specific reason these data will not have an open access licence. Thus, when needed coherent integrations of rules, with respect to the Med-Gold Grant and Consortium Agreement, will be discussed and adopted by the partners on a case by case.

As already mentioned during data analysis, personal data will be accessible only by certified members of the project team. It will be removed any direct identifiers in the personal data before depositing it within selected repositories for dissemination.

3.4 Interoperable data

The [Dublin Core Scheme](#) for interoperability¹ is a small set of vocabulary terms that can be used to describe digital resources (video, images, web pages, etc.), as well as physical resources, and objects. This minimal set of 15 attributions will be adopted by the MED-GOLD project as a reference base for interoperability to build metadata information. Metadata will be generated to describe the generated data in open format (e.g.: .xls, .odt, .tiff, netCDF, grib, grib2, geoTIFF and others) and will be stored alongside. Furthermore

¹ From wikipedia: [Interoperability is a characteristic of a product or system, whose interfaces are completely understood, to work with other products or systems, present or future, in either implementation or access, without any restrictions.](#)

MED-GOLD project will adopt standard format for processed and generated data in order to encode metadata as part of data file directly (e.g. netCDF, HDF, geoTIFF, etc); while for other types of data that could not be stored in standard formats, an accompanied metadata file will be specifically created and stored properly to ensure interoperability.

Here the list of elements that will adopted to identified interoperable standards:

Dublin Core Content list: *Coverage, Description, Type, Relation, Source, Subject and Title*

Intellectual Property list: *Contributor, Creator, Publisher, Rights*

Instantiation list: *Date, Format, Identifier, Language*

In addition to the research community MED-GOLD will produce processed and generated data that will be used by a large community of practitioners, stakeholders and policymakers. For this reason, the project team has created a series of dedicated web sites to manage and distribute these data and associated information so users can participate by adding new content over time (see as examples, among others: an informative web site <https://forum.med-gold.eu/>; a platform for services delivery <https://platform.med-gold.eu/>; a download platform for public datasets <https://data.med-gold.eu/> .

The future updated versions of DMP will regularly revise these adopted rules to run smoothly the large and heterogeneous MED-GOLD Partners Consortium. A planned review of DMP is scheduled for November 2019.

4 ALLOCATION OF RESOURCE

Project team staff time has been allocated to the approved budget to develop a common ICT infrastructure and data management platform providing a comprehensive horizontal set of common data-management, normalisation and storage tools on which the services for the three sectors (wine, olives and durum wheat) will be implemented. A specific set of rules on storage policies and backup strategies have been adopted:

Storage policies		
Policy Name	Applied to	Description
General Purpose SSD (gp2)	Virtual Machine Disk Volumes	Persistent block storage volumes for use with Virtual Machine. Provides redundancies within its Availability Zone to protect against failures. Encryption and access control policies deliver a strong defense-in-depth security strategy for your data. EBS volume types offer durable snapshot capabilities and are designed for 99.999% availability.
S3	Data sets files, Output files, DB/Disk Daily	Object storage service that offers industry-leading scalability, data availability, security, and performance.

	Snapshots	Designed for 99.999999999% (11 9's) of durability
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Backup strategies			
Type	Applied to	Goals	Method
Disk Image	Virtual Machine Disk Volumes	Allow self healing, immutable infrastructure design	Manual (on VM update). Store a complete disk image for virtual machines, using tools provided by cloud vendor
DB Daily Snapshots	Database systems	Allow manual restore. Stored on high durability, replicated storage. Encryption in transit and at rest using private/public keys. Retention is 35 days	Automated by cloud provider
Disk Daily Snapshots	Virtual Machine Disk Volumes	Volume daily snapshot uploaded on high durable cloud Storage. Encryption in transit and at rest using private/public keys. Retention is 180 days	Cron "create snapshot" script run on VMs
Continuous Backup	Database systems	Continuous backup with point in time restore. Max retention is 35 days	Automated by cloud provider

5 DATA SECURITY

The research data from this project will be made available for partners through the [MED-GOLD](#) ICT platform. As mentioned above, for data, software and documentation in a final and consolidated version, ready for a wider dissemination out of the MED-GOLD project borders, other web platforms solutions such as [Zenodo](#) represent valid options. This kind of dissemination tools allows researchers to deposit both publications and data, ensuring that the research community has a long-term access to the information after the MED-GOLD lifespan period.

6 ETHICS AND INTELLECTUAL PROPERTY RIGHTS

MED-GOLD project complies with ethical principles (including the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct). The data collected will never include information raising ethical issue (e.g. user behaviour and health related). Additional cases that may arise will be regulated, during the project lifetime, according to the Grant Agreement and the Consortium Agreement. Data will be formalized in structured databases for the purposes of elaborations to be carried out in the project.

Regarding the Intellectual Property (IP) ownership results shall be owned by the project partner carrying out the work leading to such Results. If any Results is created jointly by at least two project partners and it is not possible to distinguish between the contribution of each of the project partners, such work will be jointly owned by the contributing project partners. The same shall apply if, in the course of carrying out work on the project, an invention is made having two or more contributing parties contributing to it, and it is not possible to separate the individual contributions. Any joint Results, including inventions and all related patent applications and patents shall be jointly owned by the contributing parties. In order to further the competitiveness of the EU market, and to enhance the exploitation of the Consortium Results, each contributing party shall have full own freedom of action to exploit the joint IP as it wishes, and further the goals of the consortium. To promote this effort, the contributing party will have full own consideration regarding their use of such joint Results and will be able to exploit the joint IP without the need to account in any way to the other joint contributor(s). Further details concerning jointly owned Results, joint inventions and joint patent applications are addressed in the Consortium Agreement.

7 REFERENCES

The following documents, although not part of this document, amplify or clarify its contents. :

Table 2-2 Reference Documents

Ref.	Title	Code	Vers.	Date
[RD.1]	H2020 Guidelines 1: “Guidelines on the Implementation of Open Access to Scientific Publications and Research Data in projects supported by the European Research Council under Horizon 2020.”			
[RD.2]	OMB Circular A-110; Uniform Administrative Requirements for Grants and Other Agreements with Institutions of Higher Education, Hospitals and Other Non-Profit Organizations (11/19/1993) (further amended 09/30/1999, Relocated to 2 CFR, Part 215 (32 pages, 243 kb))			
[RD.3]	Wilkinson, M. D. <i>et al.</i> The FAIR Guiding Principles for scientific data management and stewardship. <i>Sci. Data</i> 3:160018 doi: 10.1038/sdata.2016.18 (2016).			
[RD.4]	Hengl T, Wheeler I, MacMillan RA. 2018. A brief introduction to Open Data, Open Source Software and Collective Intelligence for environmental data creators and users. <i>PeerJ Preprints</i> 6:e27127v2 https://doi.org/10.7287/peerj.preprints.27127v2			



ANNEX A: RAW DATA LIST

Link to [Annex A](#)

ANNEX B: DATA MANAGEMENT PLAN AND INTELLECTUAL PROPERTY RIGHT ACCESS MATRIX SCHEME

Link to [Annex B](#)





END OF DOCUMENT

