EMME-CARE
EASTERN MEDITERRANEAN
MIDDLE EAST – CLIMATE &
ATMOSPHERE RESEARCH CENTRE

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EMME-CARE

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D7.1 Report on the structure of the Impact and Policy Department

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V1	25/07/2023	Initial version	Finalisation of Template-document, with concrete indications of inputs needed	MPG
V2	02/08/2023	Advanced Draft	Integration and refinement of inputs from CYI and CEA	All MPG
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I. Introduction

I.1. Contribution to WP7

This document is Deliverable D7.1 "***Report on the structure of the Impact and Policy Department***" which describes the efforts and outcome of the work of Task 7.1. A brief overview of how this Task is contributing to WP7 "***Impact and Policy Department***" and interconnects with other Tasks and Deliverables of this WP is summarized below.

- **Task 7.1. Creation of an Impact and Policy Department** (Lead: MPG) (M12 -M48)

a. Support the recruitment of highly qualified research staff and young, international talent (linked to Task 2.2).

b. Actively engage in competitive research and the pursuit of scientific excellence to develop knowledge of environmental and climate change impacts and policies within the region, building on climate projections, risk analyses and impact assessments. Help establish and leverage the Professorship Programme.

Status: **Completed**. Submission on M48 of Deliverable D7.1 "***Report on the structure of the Impact and Policy Department***"

- **Task 7.2. Health impact assessment (air quality, climate change)** (Lead: MPG) (M12-M84). Status: **On-going**. Submission of this Deliverable D7.2 on M48
- **Task 7.3. Methodologies to support implementation of national adaptation plans** (Lead: CyI) (M12-M84). Status: **On-going**. Submission on M48 of Deliverable D7.3 "***Report on methodologies to support implementation of national action plans***"
- **Task 7.4. Impacts on key economic sectors** (Lead: CEA) (M24-M72). Status: **On-going**. Submission on M48 of Deliverable D7.4 "***Report on impacts on key economic sectors***"
- **Task 7.5. Impacts of GHG emission mitigation scenarios** (Lead: CEA) (M36-M84). Status: **On-going**. Submission on M48 of Deliverable D7.5 "***Report on impacts of mitigation scenarios with contribution of EMME and other emitters to the Paris goals***"
- **Task 7.6. Legal framework and policy aspects of (inter)national climate initiatives** (Lead: MPG) (M36-M48). Status: **On-going**. Submission on M84 of Deliverable D7.6 "***Report on legal and policy aspects of (inter)national climate initiatives***"

I.2. Structure and overview

The Deliverable 7.1 at hand, as per the GA, reports on the **structure of the Impact and Policy Department (IPD) of CARE-C**. It presents a description on its the establishment, structure and functions. It further showcases the role of the IPD in alignment with the EMME-CARE scientific objectives, its linkage to the national and international research and policy making landscape. The reporting of specific research output and achievements is facilitated in Section IV (Impacts and Policy Department roadmap) with cross-referencing to already completed WP7 Tasks and Deliverables (D7.2, D7.3, D7.4, D7.6), demonstrating the progress made.

The department offers policy-relevant, environmental and climate change impact assessments, **linking to scenario and downscaling modelling studies by the Environmental Predictions Department (EPD)**. Regional climate change adaptation, air quality mitigation strategies, and policy options are being developed, supported by the Professorship Programme. Impact analyses will be performed, both for specific sectors (e.g., health), and across sectors, by considering socioeconomic consequences. This is supported by consultation and collaboration with stakeholders. Policy options will focus on sustainable solutions and transformation pathways for Cyprus and the EMME.

I.3. Operational context

As justified at point #26 in the History of Changes section of Amendment document (Ref. No AMD-856612-6), after the initial delay in establishing it (partly due to COVID-19 induced restrictions in mobility and related budget constraints), the IPD Department was fully launched in September 2022.
The work in the Impact and Policy Department relies on the generated data and science and involves effort from other CARE-C Departments and CyI Research Centers. A mature component of the work is the assessment of atmospheric and climate change impacts in the EMME, with an emphasis on public health. Since climate change and air quality share many common sources and processes, another focus is the development of amelioration strategies that often combine the goals of limiting climate change and reducing air pollution. Thus, associated research on human health impacts and vectors linked to diseases, benefits from the concurrent modelling work and during this first stage of the Department's development, constituted a productive part of its activities. Other established or emerging lines of work include greenhouse gas (GHG) emission and air pollutant reporting and analyses, and national and regional initiatives of policy advice for climate change adaptation, serving distinct WP7 tasks. **The research from IPD is linked to STeDI-RC** (https://www.cyi.ac.cy/index.php/stedi-rc/about-the-center/stedi-rc-center-overview.html), the new Science and Technology Driven Policy and Innovation Research Center of the Cyprus Institute launched in 2022, which aims to translate results of CyI's research activities to actionable knowledge that can support public policy (including scientific support for the Implementation of the European Green Deal).

II. Structure of IPD

II.1. Establishment of the Impacts and Policy Department (IPD)

The IPD currently has five **(5) active research groups**, three of them emerging from the EPD and operating since 2019, plus two new groups established after the launch of the Department. The groups are led by senior research / faculty staff and address the WP7 Tasks (visually summarized in Fig. 1):

- **Climate and Vector-Born Diseases** (Head: Assoc. Res. Scientist Kamil Erguler):
The group aims at improving the understanding of the intricate physiological links between disease vectors, the pathogens they transmit, and their environment to quantify the climate impacts on the risk of future disease outbreaks. Through developing mathematical models applicable at different spatial and temporal scales, the group aims at generating reliable risk predictions and advancing vector control and outbreak management strategies. By developing interactive open-source digital platforms, the group aims at facilitating user engagement, data sharing, and communication with citizens, public health experts, and fellow researchers

- **Climate Change and Health** (Head: Assoc. Res. Scientist Theo Economou):
The overarching aim of the group is to understand the effects of climate change on human and domestic animal health in the EMME region. The research activity of the group lies at the interface of observational environmental data, physical model output data and health data, employing statistical/mathematical/AI methods along with data analytics skills to integrate the various sources of information

- **Climate Policies** (Head: Prof. Costas Papanicolas):
The main activity of this group is the scientific and policy support of the Eastern Mediterranean and Middle East Climate Change Initiative (EMME CCI) launched by the Government of the Republic of Cyprus in 2019. Specific goals are to enhance:

- Scientific understanding and prediction of regional climate change impacts and identify appropriate adaptation and mitigation measures
- Pertinent policies in coordination with transnational and multinational stakeholders and organizations through support of the implementation of Paris Agreement and National Plans and investigation of specific techno-economic scenarios to mitigate climate change effects in the EMME countries

- **Greenhouse Gases** (Head: Prof. Philippe Ciais):
Monitoring greenhouse gas emissions accurately is important for assessing baselines and policy effectiveness of emission reductions. The main objective of the GHG team is to develop and apply methods based on bottom-up information (activity data and emission factors) and top-down atmospheric concentration measurements to infer national and subnational emissions of the main GHGs : CO_2 and CH_4, and co-emitted pollutants including CO, NO_x, SO_2, NH_3. Methods used are from bottom-up inventories and top-down inversion models. Atmospheric in situ data being sparse in the Middle East and Eastern Mediterranean area, we mainly focus on the exploitation of satellite measurements, including GOSAT, TROPOMI and OCO2 / OCO3 for GHGs. Estimates of national emissions and trends are also used in a simplified Earth System Model to project future warming given conditional and unconditional NDCs pledges and identify the contribution of countries and groups of countries to the coordinated mitigation efforts of the Paris agreement. The work supports policy applications and feeds back results to scientific applications within EPD.

- **National Emissions Reporting** (Head: Res. Scientist Jonilda Kushta):
The National Emissions Reporting (NER) team supports the competent government agencies for the monitoring, validation/verification and reporting of the air pollutants and greenhouse gas emissions in Cyprus. Specifically, the group collaborates with the Dept. of Environment for the calculation and compilation of the Greenhouse Gas Inventory and Projections, and the Dept. of Labour Inspection for processing and the harmonization of the activity data required for the reporting of Air Pollutants.

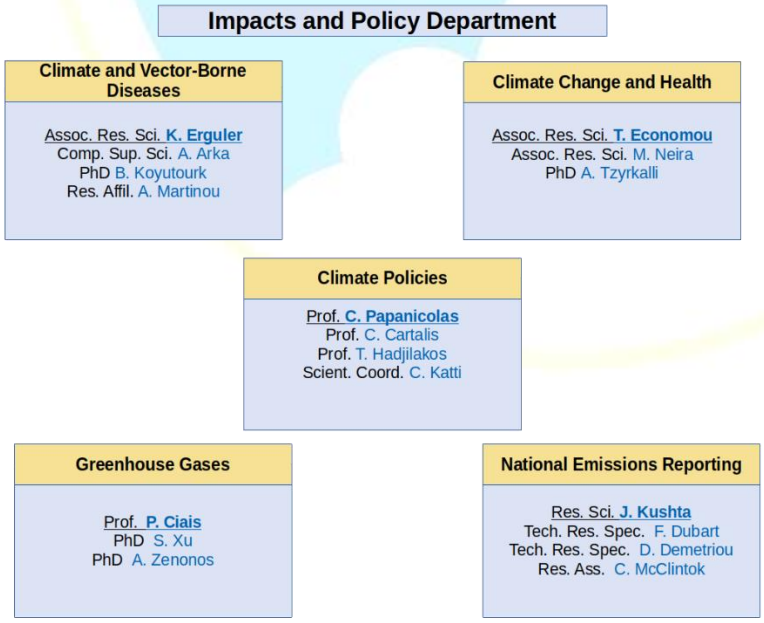

Figure 1: IPD group structure and composition.

III. Alignment of the IPD objectives with EMME-CARE objectives

The activities of IPD described in the next section contribute directly to the EMME-CARE "**Research objective #3** on regional impact assessments: "***building on process understanding and data-informed modelling that contribute to assessments of the impacts of environmental and climate change on public health, society and economic sectors***".

The Impacts and Policy Department relies on the close collaboration of personnel and builds on the scientific output originating in the Environmental Observations (atmospheric composition measurements) and Environmental Predictions (atmospheric and climate modelling) Departments (respectively, EOD and EPD). Its above stated objective is pursued by translating scientific data and outcomes from/with these two departments to provide impact assessments and policy related and societally relevant studies and initiatives for tackling global and regional environmental challenges such as climate change, air quality degradation and the perturbation of biogeochemical cycles that affect several ecosystems and socio-economic sectors. The linkages between the IPD groups and the WP7 tasks are depicted in Fig. 2 below.

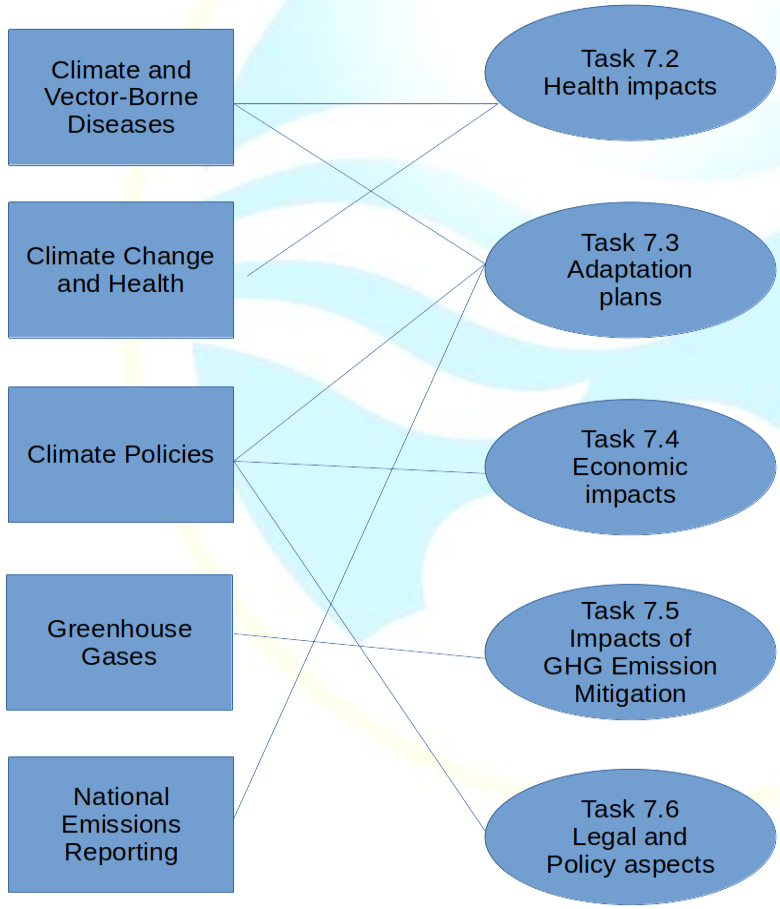

Figure 2: IPD group links with WP7 Tasks

IV. Impacts and Policy Department roadmap

IV.1. Supporting recruitment of high qualified research staff and young international talents

The fulfilment of **Task 7.1.a (*Support the recruitment of highly qualified research staff and young international talents (linked to Task 2.2), leveraging the R&D Mobility Programme, as well as part of Task 7.1b to establish and leverage the Professorship Programme*),** (Lead: MPG; M12 -M48) has materialised by utilising at first existing CyI and EPD personnel with already established research record and experience (J. Kushta in National Emissions Reporting, K. Erguler in Climate and Vector-Born Diseases, and C. Papanicolas in Climate Policies) and attracting **new expertise** (P. Ciais in Greenhouse Gases and T. Economou in Climate Change and Health) to lead the aforementioned IPD groups. Professor **Philippe Ciais** is a very **highly cited academic** and his research during the last thirty years has enabled significant step towards understanding the **relationships between terrestrial greenhouse gas fluxes and climate**, combining ecosystem models with satellite and eddy-covariance observations. Adjunct Professor **Costas Cartalis**, in the Climate Policies group, a Professor of Environmental and Climate Physics and Director of the Laboratory of Environmental Physics-Meteorology at the National and Kapodistrian University of Athens (Greece), has been **recruited through the EMME-CARE Professorship Programme**, combining expertise on research in climate induced vulnerability of sectors such as cities, tourism, forests and the natural environment and high-level policy advise as a member European Scientific Advisory Board on Climate Change. Dr **Theo Economou**, brings his **statistical analysis expertise** from his UK Met. Office employment for climate change and impact applications, with emphasis on **climate change and health**.

Below we list (in chronological order) the new hirings (in parenthesis the start year) fulfilling the recruitment of highly qualified research and Faculty staff and young international talents recruited with EMME-CARE funding:

List of recruited staff of IPD:

Florence Dubart, Technical Research Specialist (2019) National Emissions Reporting
Demetris Demetriou, Technical Research Specialist (2019) National Emissions Reporting
Christiana Katti, Scient. Coordinator (2020) Climate Policies
Constantinos Cartalis, Adjunct Professor (2020) Climate Policies
Marco Neira, Assoc. Res. Scientist (2020) Climate Policies/Climate change and Health
Theo Economou, Assoc Res Scientist (2021) Climate change and Health
Corey McClintock, Technical Research Specialist (2021) National Emissions Reporting
Philippe Ciais, Professor (2021) Greenhouse Gases
Anna Tzyrkalli, Graduate Research Assistant (2022) Climate change and Health
Ahmet Arca, Computational Support Specialist (2023) Climate and Vector-Born Diseases
Behich Koyutourk, Graduate Research Assistant (2023) Climate and Vector-Born Diseases

List of PhD Student & PhD research projects:

The following PhD projects (the ones before 2022 within EPD) are fulfilling the objectives of the IPD and WP7 and caried out in co-supervision mode with senior researchers and Faculty between **IPD** and EOD/EPD, the Advanced Partners, and via the Professorship Programme:

1. Detection and quantification of the emissions of greenhouse gases and pollutants using satellite data across the eastern Mediterranean and Middle East region. (2020 - present, **PhD student: A. Rey-Pommier**, supervisor/advisors: T. Christoudias , J. Kushta & **P. Ciais,** jointly with CARE-C EPD and CEA (EMME-CARE Advanced Partner)

2. Techno-Economic Assessment of Policies for Anthropogenic Air Pollutants. (2021 - present, **PhD student: P. Kiriakidis**, supervisor/advisors: T. Christoudias & **J. Kushta,** jointly with CARE-C EPD)

3. Global and regional health effects of air pollution. (2021 - present, **PhD student: N. Paisi**, supervisors /advisors: J. Lelieveld & T. Christoudias & **J. Kushta,** jointly with CARE-C EPD)

4. Coupling Climate Change to Cities for Spatial and Temporal Variable Heat Mitigation Measures. (2022 - present, **PhD student: K. Koutroumanou**, supervisors/advisors: **C. Cartalis** & P. Hadjinicolaou, jointly with CARE-C EPD & NKUA (Athens, Greece)

5. Effect of urbanization on the association between environmental risk factors and human health. (2023 - present, **PhD student: A. Tzyrkalli**, supervisors/advisors: **T. Economou**, P. Hadjinicolaou, jointly with CARE-C EPD)

6. Modelling climate sensitivity of vector-borne diseases. (2023 - present, **PhD student: B. Koyutourk**, supervisors/advisors: T. Christoudias, J. Lelieveld, **K. Erguler**, jointly with EPD)

7. *Vegetation - Dust Cycle Feedback in the IPSL Earth System Model.* (2023 - present, **PhD student: S. Xu**, supervisor: **P. Ciais**, jointly with CEA (EMME-CARE Advanced Partner)

8. Digital twinning of all forest and non-forest trees at national level via deep learning. (2023 - present, **PhD student: A. Zenonos**, supervisors: **P. Ciais** & J. Sciare, jointly with CARE-C EOD & CEA/LSCE)

IV.2. Engagement in competitive scientifically excellent research activities

This sub-section documents the fulfilment of **Task 7.1.b (*"Actively engage in competitive research and the pursuit of scientific excellence to develop knowledge of environmental and climate change impacts and policies within the region, building on climate projections, risk analyses and impact assessments"*)**.

The progress made in the scientific production and advancement is reflected in the completion of the following WP7 Tasks which contain direct outcomes of the IPD groups' work (and contributions from EPD's modelling results:

Task 7.2. Health impact assessment (air quality, climate change) (Lead: MPG; M12-M84)**:** This task has been completed (but extended to M84 as per the Amendment) with contributions from the groups Climate and Vector Borne Diseases (IPD), Climate Change and Health (IPD), National Emissions Reporting (IPD), Emissions and Regional Air Quality Modelling (EPD), Climate Change Downscaling and Weather Extremes (EPD), Modelling and Data Analysis Tools (EPD). The detailed description of this Task's achievements can be found in the **D7.2: Report on health impacts assessment**, which includes evaluation of the:
- **direct health impact of heat extremes and air pollution** (and their combined effects) through high-resolution model-based assessments and emphasis on urban environments
- **indirect health impacts of climate change** (linked to water/food security, the spread of vector-borne diseases), including modelling underlying environmental processes such as vector dynamics, and investigation of the causes/consequences of environmental and climate change pressures in relation to migration.

Task 7.3. Methodologies to support implementation of national adaptation plans (Lead: CyI, M12-M84)**:** This task has been completed (but extended to M84 as per the Amendment) with contributions

from the groups National Emissions Reporting (IPD), Climate Change and Health (IPD), Emissions and Regional Air Quality Modelling (EPD), Climate Change Downscaling and Weather Extremes (EPD). The detailed description of this Task's achievements can be found in the **D7.3: Report on methodologies to support implementation of national action plans**, which provides details of the work done to support coordination, monitoring and **updating of national action plans in compliance with EU directives** and international protocols, and further extend them to other countries in the EMME through the Professorship Programme. Research activities conducted under this task have provided robust scientific options to support public organizations with recommendations, guidelines and measurable outputs towards effective design and efficient implementation of the national action plans on climate change and air pollution.

Task 7.4. Impacts on key economic sectors (Lead: CEA; M24-M84)**:** This task has been completed (but extended to M84 as per the Amendment) with contributions from the groups Climate Policies (IPD) and Climate Change Downscaling and Weather Extremes (EPD). The detailed description of this Task's achievements can be found in the **D7.4: Impacts on key economic sectors** which presents research **findings and policy suggestions of climate change impacts on key economic sectors** such as the energy sector, agriculture and the food chain, tourism and maritime transport.

Task 7.5. Impacts of GHG emission mitigation scenarios (Lead: CEA; M36-M84): This is an on-going work (to be completed by the end of EMME-CARE) aiming to analyse GHG emissions from all countries in the world including the EMME region, using updated inventories and atmospheric analysis from WP6 to define the current baseline over the recent historical period. Emissions mitigation will be assessed by collecting and interpreting each national pledge and the neutrality goals that have been produced by some countries like Saudi Arabia, as well as other contextual information obtained from the implementation of pledges and COP official documents. Then we will use this information to construct future emission scenarios for each country and calculate their contribution to the total future CO_2 increase, the global temperature increases and the remaining emission CO2 budget for different global warming levels. The ACC2 simplified climate carbon economy model will be used in this sub-task and to analyse the contribution to global warming of each country for each greenhouse gas and the pertaining costs of mitigation.

Task 7.6 Legal framework and policy aspects of (inter)national climate initiatives (Lead: MPG; M36-M84): This task has been completed (but extended to M84 as per the Amendment) with contributions from the group Climate Policies (IPD). The detailed description of this Task's achievements can be found in the **D7.6: Report on legal and policy aspects of (inter)national climate initiatives** containing description of the motivation, governance, scientific coordination and political execution of the Eastern Mediterranean and Middle East Climate Change Initiative (EMME CCI) that was carried out by the Cyprus Institute (with major contributions from CARE-C), including:

- Regional Action Plan for EMME
- 2nd International Conference on Climate Change in the EMME
- Participation in COP26
- Ministerial meeting in 2022
- Heads of State Summit in COP27

IV.3. Sustainability of the Impact & Policy Department

The sustainability of the research progress of the IPD groups documented above is being supported by their successful coordination or participation in competitive research funding efforts obtained since 01/08/2022 and as of 31/07/2023) as listed below:

List of competitive research funding:

Acronym/title	IPD group PI	Funding source	IPD Budget (K€)	Duration
SIRIUS: A System for Integrated EnviRonmental Information in Urban areaS	J. Kushta	EU LIFE	204	2022-25
FT-DABS-FULL: Field trials of dried attractive bait stations to control Aedes aegypti	M. Neira	USA Centers for Disease Control and Prevention (CDC)	20	2022-23
HeatRisk: Strengthening Cyprus-UK collaboration on climate change impacts research	T. Economou	UK British High Commission in Cyprus	7	2022-23
VECLIM: Climate-driven vector-borne disease risk assessment	K. Erguler	UK Welcome Trust	610	2023-27
AVENGERS: Attributing and verifying European and national greenhouse gas and aerosol emissions and reconciliation with statistical bottom up estimates	J. Kushta	EU Hop-on	493	2023-26
PREVENT: Improved Predictability of Extremes over the Mediterranean from Seasonal to Decadal timescales	T. Economou	Horizon Europe	100	2023-26

V. Risk Management Plan

Risk management plan for the Impacts and Policy Department:

Risk	Proposed risk-mitigation measures (contingency plan)
Recruitment of Faculty: Difficulty to recruit new Faculty in IPD. **Probability**: Medium. This is the result of the young age of the Department (formally operational for one year only) due to the initial delay in launching it (caused by COVID-19 constraints and Institute budget limitations). **Severity**: Low. Several research groups have been established by young talented researchers (as Head of Group) without recruitment of international Faculty	Short-term measures: PhD student co-supervision mode with relevant Faculty members of other CARE-C Departments and Cyl SteDI Research Center. Medium-term measures: Promotion opportunities from the Research to the Faculty career path (for Heads of Groups).

VI. Key Performance Indicators (KPIs)

The indicators below reflect the scientific output in terms of outcome (reports & government interactions, journal publications), effectiveness (i.e., quality and impact) (e.g., in high impact journals), efficiency outcome/impact per invested human resources). The definitions will be revisited and values will be updated (e.g. for 2023 refer to data collected until 31/07/2023).

WP No.& Title	**WP7 – Impacts and Policy Department**				
Dimension	**Key Performance Indicator**	**2022**	**2023**	**2024**	**Target 2027**
Output	Number of scientific journal publications	17	16	25	40
	Number of contributions to policy reports	2	1	2	3
Efficiency and Impact	Number of publications per engaged FTE	1.6	1.3	1.7	2
	Percentage of scientific publications in high impact factor journals (WoS IF > 4)	76	81	83	90

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