

# **PROJECT DELIVERABLE REPORT**



# Introducing advanced ICT and Mass Evacuation Vessel design to ship evacuation and rescue systems

# D1.8 Ethics Manual and Guidelines for data protection and safety in passenger ships

A holistic passenger ship evacuation and rescue ecosystem MG-2-2-2018 Marine Accident Response

## **Document Information**

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## Abbreviations

AAL	Active and Assisted Living
DPO	Data Protection Officer
EESSR	Ethic Evaluation Standard for Security Research
GCS	Ground Control Station
GDPR	General Data Protection Regulation
MEESTAR	Model for Ethical Evaluation of SocioTechnical ARrangements
MOB	Man Over Board
MS	Milestone
PaMEAS	Passengers Mustering and Evacuation Automation System
SSH	Social Science Humanities
UAEGEAN	University of Aegean Sea
UAV	Unmanned Aerial Vehicle
MEV	Mass Evacuation Vessel
MEDEVAC	Medical Evacuation

#### Summary

D1.8 was written during the project time, starting already in 2020 after the submission of D1.7.

In this time, several ethic workshops have been done to evaluate the projects developments and aims from the perspective of society and first responders. This should lead to suggestions to the developers and support further innovations.

The basic stock of this deliverable was ready in mid of 2020.

Second part of the deliverable was finalized in May 2022 for the original deadline of the project. The final evaluation of the prototype was added in Jan 2023 after the pilot experience from Dec. 15<sup>th</sup> aboard the ELYROS.

As a methodology for the ethical assessment, the EESSR (Ethical Evaluation Standard for Security research) was used as workshop structure and evaluation categorisation.

The workshop line of EESSR was considered the ethical helpdesk for the project.

PALAEMON Deliverable 1.7 Ethics State of the Art Report (PALAEMON, 2020) showed that the establishment of bodies and contracts is needed for the project to be in line with legal and ethical requirements. On this basis in the present deliverable, the need of the involvement of a Data Protection Officer (DPO), but also of ethics committees in the trial-conducting countries Greece, Cyprus and Germany, to preserve the trial participants' rights and wellbeing is described.

Further, especially researchers, data processors and -controllers of PALAEMON must be protected by contracts which are based on and therefore strongly recommended by the General Data Protection Regulation (The European Parliament and the Council of the European Union, 2016) and the Charter of Fundamental Rights (The Council of the European Union, 2013). Besides, they also rely on the existing (guidelines for) Code of Conducts. Namely, the herein presented contracts are

- The Appointment as Data Processor in accordance with the GDPR, Art. 28 (The European Parliament and the Council of the European Union, 2016) that must be established between each data processor and each data controller, and
- PALAEMON's Ethics Code of Conduct for Research (see 3.2) that regulates an ethically correct cooperation of all parties of the project and especially of researchers and trial participants.

Furthermore, for an identification and analysis of ethical problems that occurred or might occur in the future, the conduction of Ethic Evaluation Standard for Security Research (EESSR; see 4) workshops were planned for the technical development during the whole duration of the project PALAEMON. Due to development delays, the final workshop with the prototype was not possible. The pilot support team of Johanniter Österreich Ausbildung und Forschung gemeinnützige GmbH (JOAFG) did after the pilot on the 15<sup>th</sup> December 2022 a short wrap up of the existing, testable prototypes to allow a final conclusion.

#### 1 Introduction

This present deliverable functions as a manual for the practical implementation of legal regulations and ethics (edited in PALAEMON's D1.7 (2020)). On their basis, issues concerning the question "What will be needed in PALAEMON and its trials in regard to ethics?" are dealt with and answered by bodies and contracts, which need to be established in time - if not happened yet.

Therefore, the present deliverable's first section describes the need for bodies – in line with regulations and ethics principles – namely the DPO (see 2.1) and the involvement of ethics committees (see 2.2). Thereafter, two contracts are introduced: the Appointment as Data Processor (see 3.1) and PALAEMON's Ethics Code of Conduct for Research (3.2), which applies to all project partners as well as the trial participants. In the last section, the use of EESSR, a model for ethics evaluation during the project (described in D1.7 (PALAEMON, 2020)), is presented.

The first part of the deliverable was written already during the first phase of the project to provide a concretise the findings of D1.7 and allow the setup of needed structures during the project runtime. By this foundation of bodies, the following examination for ethics and GDPR aspects have been undergone. Especially in 4 workshops by the methodology of the Ethical Evaluation Standard for Security Research, more detailed findings and analysis could be gathered. The feedback from the workshops was then forwarded to developers to be considered. Also, another aim was to provide a discussion format for the project if the need for explanations on behalf of ethical findings come up.

Over the project period, several workshops have been held and the findings are wrapped up here as a report on the ethical helpdesk.

This deliverable is related to D1.7 and to Tasks T1.4, T2.1, T2.2, T4.4, T8.4, T8.5, T9.2 and T9.5. It should cover the Ethical Watch for the developments and the Pilot Coordination support from Data management Perspective.

The output is dedicated to support further developments with the perspective of better acceptance of solutions by crew and passengers as well as for legal aspects concerning data protection and privacy.

#### 2 Bodies

#### 2.1 Data Protection Officer

As declared in the General Data Protection Regulation (GDPR), a project, and so PALAEMON too, – as a group of undertaking – has to designate one Data Protection Officer (DPO) who fulfils the requested competences.

The DPO has to fulfil several tasks; his/ her core competences are:

- Monitoring the compliance with the GDPR;
- Advising and informing processor<sup>1</sup> and controller<sup>2</sup> and their employees;
- Being the advice-giving contact person for all project partners in data protection queries;
- Acting as contact point for the supervisory authority.

A DPO is needed when personal data are processed. However, for PALAEMON, the project partners must designate a DPO in the project phase of preparing the trials. It is recommended to nominate a DPO in an early stage of the project. By this, it can be ensured that it is thought and acted according to the GDPR in all stages of the development.

The DPO must be designated by the controller publicly – this could be on the PALAEMON website (<u>palaemonproject.eu</u>), e.g., at <u>https://palaemonproject.eu/who-we-are/key-persons/</u> by the publication of the full contact data. Additionally, the DPO must be announced to the data protection authority by the project leader.

#### 2.2 Ethics Committees

In PALAEMON, ethic approvals are planned in WP8, Task 8.1 "Pilot Organization Set-up and Preparation", in the preparation phase of the trials. Such approvals must be done by ethics committees for social science.

In PALAEMON, trials of social research will be conducted in Greece, Cyprus and Germany. Thus, in those three countries, ethic approvals should be obtained from responsible ethics committees.

However, the establishment of such ethics committees is not regulated by European law. Furthermore, not all EU countries' public or private institutions have installed such a body – the situation in Greece, Cyprus and Germany must be examined at the latest at the very beginning of the first trial preparation phase. In a document of the European Commission for Horizon 2020 projects involving activities of Social Science Humanities (SSH) (2018), it is written:

<sup>&</sup>lt;sup>1</sup> GDPR, Chapter 1, Art 4 (8): "processor' means a natural or legal person, public authority, agency or other body which processes personal data on behalf of the controller (The European Parliament and the Council of the European Union, 2016)

<sup>&</sup>lt;sup>2</sup> GDPR, Chapter 1, Art 4 (7): "controller' means the natural or legal person, public authority, agency or other body which, alone or jointly with others, determines the purposes and means of the processing of personal data; where the purposes and means of such processing are determined by Union or Member State law, the controller or the specific criteria for its nomination may be provided for by Union or Member State law' (The European Parliament and the Council of the European Union, 2016)

"If your institutional/national framework makes no provision for a research ethics committee which you can approach to obtain authorisation or approval for the SSH research you intend to perform, you can consider the following options. An ethics opinion may be given, for example, by:

- the coordinator's institutional research ethics committee;
- the institutional research ethics committee of another research partner; or
- a relevant authority in the country (if applicable), which may give its approval."

Below, an example is presented as a possible solution for dealing professionally with ethical issues in case of a lack of adequate ethics commissions.

#### 2.2.1 Johanniter's Ethics Board

As a matter of fact, the JOAFG was confronted in the past with a lack of responsible ethics committees in Austria. However, as the mother company deals with the health of persons in its services and is moreover a Christian non-profit organization, very competent persons in this field were available who had already served the organization in the sense of ethical monitoring of everyday tasks – up to that time in a quite unstructured but low-threshold way. As a consequence, Johanniter in Austria established an Ethical Board for these matters:

The ethics board of the Johanniter in Austria consists of 5 members:

It is led by o.Univ. Prof. Dr. Dr. Ulrich Körtner, who serves as director of the Institut für Systematische Theologie und Religionswissenschaft (En.: Institute for Semantic Theology and Religious Studies) and also as director of the Institut für Ethik und Recht in der Medizin (En.: Department for Ethics and Law in Medicine) of the medical university of Vienna and the University of Vienna. Furthermore and among others, he is a scientific advisory board member of the interdisciplinary centre "Medicine - Ethics - Rights" of the Martin-Luther-Universität Halle-Wittenberg, scientific advisory board member of the Austrian platform for patient safety, and scientific advisory board member of the university course "patient safety and quality in health care". Additionally, he is the award winner of the Viennese award for humanistic agerelated research 2015 (De.: Wiener Preis für humanistische Altersforschung 2015) and of the scientist of the year 2001 (Klub der Bildungs- und Wissenschaftsjournalisten; En.: Club of education and science-journalists). Two members of the board, Dr. jus. Heinrich Weninger and Dr. jus. Robert Brandstetter, are legal experts. Dr. Weninger is moreover a member of the executive board of the Johanniter in Austria and still active as a voluntary emergency paramedic. Dr. Brandstetter is the CEO of the Johanniter. Prim. Dr. med. Christian Emich is chief physician in the Evangelischen Krankenhaus (En.: evangelical hospital) in Vienna, leads a doctor's office and is also active for the Johanniter in his private time; as a physician he is confronted with ethical issues in his everyday working life. The member DI Johannes Bucher is the president of the Johanniter in Austria and therefore a strong advocate of Christian values - like the other ethics board members as well.

JOAFG and the Johanniter's Ethics Board offer support to the partners as they are experienced and qualified – providing the basis for being the ethics task leader and ethical supervisor in the project.

However, PALAEMON's Ethics Code of Conduct for Research (below) merges GDPR regulations and recommendations of guidelines for ethical issues in social research. The Ethics Code of Conduct has to be seen as a minimum set.

#### 3 Contracts

#### 3.1 Appointment as Data Processor

The GDPR requires in Art. 28 (3):

"Processing by a processor shall be governed by a contract or other legal act under Union or Member State law, that is binding on the processor with regard to the controller and that sets out the subject-matter and duration of the processing, the nature and purpose of the processing, the type of personal data and categories of data subjects and the obligations and rights of the controller..."

Thus, the following contract template is recommended for use between each (!) of PALAEMON's processors and controllers:

#### Appointment as Data Processor in accordance with Art. 28 of Regulation (EU) 2016/679 (GDPR)

Whereas,

- (Data Controller's company name) on (date of signature) signed a Consortium Agreement for the European research project "PALAEMON" (H2020-MG-2018-2019-2020) that covers the period from 01.05.2019 to 30.04.2022 (see also the description of work), (hereinafter "Agreement"), of which this Appointment is an integral part;
- (Data Processor's company name), who possesses the necessary specialised knowledge, reliability and resources, sufficiently ensures that data will be processed implementing the appropriate technical and organisational measures to comply with the current provisions on the protection of personal data and to safeguard the rights of the data subjects;

with the present deed

(Data Controller's company name), with its head office in (full address), represented by its legal representative, acting in the capacity of Data Controller

#### APPOINTS

(*Data Processor's company name*), with its head office in (*full address*), represented by its legal representative (hereinafter "Data Processor"),

in accordance with Art. 28 of the European General Data Protection Regulation 2016/679 (hereinafter "GDPR"), as Data Processor only for personal data which is relevant and strictly necessary for the implementation of the Agreement, for the duration of the Agreement or until its termination and at the following conditions:

1. The Data Processor accepts the appointment and commits to comply, without any restrictions of time and place, with all the provisions on the protection of personal data, with further current legal provisions and with the following instructions. No further costs shall derive from this compliance.

2. (Data Controller's company name) reserves the right to terminate the Agreement at any time and without notice in case of severe breach of the provisions on the protection of personal data or the provisions contained in the pre-sent Appointment or in case the Data Processor does not or cannot comply with the instructions received by (Data Controller's company name) or objects, in violation of the present Appointment, to the rights of (Data Controller's company

*name)* as Data Controller. In particular, any non-compliance with the obligations set forth in the present Appointment as Data Processor and with Art. 28 GDPR is considered a severe breach of contract. In case of damage or infringements that lead to requests of compensation, the Data Processor is liable for the entire amount and/or for the civil and criminal consequences in accordance with Art. 82(4) GDPR.

3. The implementation of the Agreement may imply the processing of personal pseudonymized data (e.g., userID, logfiles, appointments, geo trackers, website/ app usage, phone calls and messages). All the data, information and results of the processing directly or indirectly transferred to the Data Processor in any form (written, electronic, oral, etc.) are considered confidential, sensitive and secret. Data are subject to the protection of personal data, intellectual property and intellectual work.

- 4. The Data Processor in particular commits to:
  - a) process exclusively data that are strictly necessary for implementing the Agreement by applying the processing principles set forth in Art. 5 GDPR (e.g., data minimisation, storage limitation), in the current legal provisions and in the present Appointment. Processing data for any other purposes such as, for example, for personal interest, internal optimisations and statistical, research or marketing purposes is not permitted.
  - b) effectively protecting all data and/or assets (e.g., information, documents, work documents, results of the processing, metadata, technical data sheets, knowledge, facilities, installations, equipment, soft-ware, etc.) of (*Data Controller's company name*) or of third parties that are being processed by the former in compliance with the current legal provisions and to demonstrating their protection. This obligation applies in particular to special categories of data according to Art. 9 GDPR and particularly to data concerning health, strategic information and business secrets.
  - c) ensure data integrity, the resilience of processing systems and services and an adequate availability of services for the implementation of the Agreement for its entire duration and to constantly applying all necessary technical and organisational measures with due regard to the state of the art.
  - d) process assets only according to the instructions by (Data Controller's company name) stipulated in the present Appointment or in the Agreement and demonstrating the relevant compliance as well as to pre-emptively informing (Data Controller's company name) of any further request of processing or information, even if required by law or by an authority (Art. 28(3a) GDPR); this obligation concerns in particular the transfer of assets or information, which shall not be disclosed in any case (e.g., through press releases) or transferred to third countries or international organisations for processing.
  - e) mandating staff authorised to process personal data and committing them to maintain confidentiality on all the data that they receive directly or indirectly, during and also beyond the termination of the Agreement, and communicating the respective names and tasks to (*Data Controller's company name*); the Data Processor also commits to instructing staff on how to process data, to raising their awareness, to supervising and demonstrating the compliance with all obligations and – upon request – sharing the relevant documentation with (*Data Controller's company name*).
  - f) ensure and demonstrate that only authorised internal staff directly in charge of implementing the Agreement process exclusively the relevant assets that cannot be

replaced by anonymized or pseudonymized data, with strictly personal means of authentication, in compliance with all legal provisions and for the time strictly necessary. The Data Processor further ensures that the processed data and documents are kept strictly separated from other data and documents and that all data and documents not strictly necessary for the implementation of the Agreement (e.g., temporary files) are immediately and permanently deleted.

- g) ask (Data Controller's company name) for a specific written authorisation whenever intending to engage other processors to perform specific activities that imply the processing of personal data; the Data Processor undertakes to impose the same obligations and instructions concerning personal data protection set forth in the present Appointment on such sub-processors as well as to hold (Data Controller's company name) free from any responsibility and liability in case of non-compliance. In particular, the contract with any sub-processor shall ensure the right of (Data Controller's company name) to perform controls and inspections, if necessary, even on-site or through third parties mandated by (Data Controller's company name).
- h) implement all appropriate measures (e.g., encryption, pseudonymisation, access and accessibility management, communication security, safety of basic systems and operations, access security, physical security, etc.) with due regard to the state of the art, Art. 32 GDPR as well as all legal and regulatory provisions to minimise risks, respect the current legal provisions on the protection of personal data and other provisions, safeguard the rights of the data subjects and ensure the effective and proven confidentiality, availability, resilience and integrity of all the systems and assets.
- assist (Data Controller's company name) effectively and without delay with state-ofthe-art technical and organisational measures when called to respond, within the terms stipulated by the law, to requests for exercising the data subjects' rights according to Section 3 of the GDPR and/or to comply with these rights of (Data Controller's company name) without delay.
- j) assist (Data Controller's company name) without delay to ensure compliance with the obligations set forth in Art. 32-36 GDPR and other legal provisions and therefore putting in place and regularly testing a process of escalation, emergency plans and regulations to comply with contractual and legal provisions.
- k) continually appraise the risks for the rights and freedoms of natural persons in compliance with Art. 25 GDPR, timely implementing appropriate technical and organisational preventative measures and previously communicating any change of risk ensuing from external or internal events and developments to (*Data Controller's company name*) via (*Email address*); in addition, (*Data Controller's company name*) shall be informed about any change in the legal and/or shareholding structure of the Data Processor.
- inform (Data Controller's company name) about any changes in processing and obtaining the relevant authorisation from (Data Controller's company name) as well as to plan and implement such changes in a systematic way according to the state of the art to comply with legal and regulatory provisions.
- m) transfer data to (*Data Controller's company name*) staff or inform staff about personal, strategic and key company data (such as data on balance sheets, confidential information, etc.) only following an authorisation by the Head of the department

performing the Agreement. In the present case, the Head is *(full name)*. Any change of name shall be communicated in a timely manner.

- n) transfer personal or strategic data to third parties or data subjects or share information about it only with prior written instruction from the legal representative of *(Data Controller's company name)*, which must be signed digitally (two-factor authentication).
- o) notify to (Data Controller's company name) via (Email address) without delay, and within 24 hours at the latest, any event concerning information security, data protection and any possible breach of contract (e.g., data breach, infringements according to Art. 33 GDPR such as access by third parties or requests, controls and inspections by the national data protection authority, etc.) to effectively support (Data Controller's company name) in managing, reporting and keeping record of events according to the provisions of the law as well as to implementing the necessary effective technical and organisational preventative measures.
- p) inform (Data Controller's company name) without delay via (Email address) in case any instruction should be considered an infringement of the provisions on personal data protection.
- q) allow and actively support, at the termination of the Agreement, the successful transfer of data to another service provider or to (*Data Controller's company name*) and to delete, after the authorisation by (*Data Controller's company name*), all data and assets from any data medium in a way that they cannot be restored, with due regard to the state of the art.
- r) share with (*Data Controller's company name*) all data and information that are necessary to prove the effective compliance with the obligations and duties set forth in the Agreement as well as, at least once a year upon request, the data-protection impact assessment. The Data Processor further commits to ensure and actively support the controls and inspections that might be performed by (*Data Controller's company name*) or by inspectors authorised by (*Data Controller's company name*).
- s) comply, in case of on-site activities, with all internal rules and regulations of (Data Controller's company name), not disrupt the normal provisions of services in any way, keep secret all data and information of (Data Controller's company name) or data subjects as well as research and services that may have been directly or indirectly received and, upon request, share the name and picture of the staff intended to work on-site with (Data Controller's company name) at least a day in advance. Any remote access to (Data Controller's company name) data shall be requested and previously authorised in writing by the legal representative of (Data Controller's company name), who will evaluate the need for remote access. Remote access shall be secured according to the state-of-the-art, all operations shall be logged according to the legal provisions (see above for access to the logs) and performed only under the surveillance of (Data Controller's company name) staff. Such access is permitted exclusively in case it is absolutely necessary and the relevant access information shall be particularly protected.

*(City)*, on \_\_\_\_\_

For the Data Controller

(Data Controller's Company Name) Legal representative

For the Data Processor, countersigned by

(Data Processor's Company Name)

Legal representative

#### 3.2 PALAEMON's Ethics Code of Conduct for Research

#### 3.2.1 Introduction

The present PALAEMON's Ethics Code of Conduct for Research does not offer a recipe in all ethical belongings; it points the way to deal with ethical dilemmas researchers might be confronted with during the project, especially when participant-involvement is addressed during the preparation-, conduction- and evaluation-phase of studies. Namely, in the context of PALAEMON, users' data will be processed in WP8.

- 1. Laws and legal standards serve as basis for all ethical aspects that must be taken into account by PALAEMON-project members.
- 2. The leader of the task T1.4 Ethical Watch and Pilot Coordination, JOAFG, takes over the role of the ethical supervisor.
- 3. Every member of the consortium has to be compliant to the present Code of Conduct and in support of the ethical supervisor responsible for its fulfilment.
- 4. Every project partner (members, especially researchers) conducting the trials and their preparations is responsible for the observation in regard to ethical and legal aspects and the fulfilment of the Code of Conduct as part of his/ her daily work.
- 5. In the case that one or more than one researcher/ consortium member does/ do not feel confident and assume an ethical or legal dilemma which doesn't fall under the competence of the DPO, the consortium member/ consortium members has/ have to report the doubts to the ethical supervisor. In the case that neither the ethical supervisor nor the consortium can disperse or solve an ethical or legal dilemma satisfactorily, the ethics committee/ board of the country where the dilemma arose has to be consulted.
- 6. Other responsibilities in the project, the ownership of results, access rights for implementation and for dissemination and exploitation activities as well as the Intellectual

Property Rights are regulated in the Consortium Agreement and therefore are not objects of the present Ethics Code of Conduct.

#### 3.2.2 Researchers

- 7. Researchers commit themselves to observe and to promote the principles of scientific integrity. These are:
  - a. "Reliability

in ensuring the quality of research, reflected in the design, the methodology, the analysis, and the use of resources.

b. Honesty

in developing, undertaking, reviewing, reporting, and communicating research in a transparent, fair, full, and unbiased way.

- c. Respect for colleagues, research participants, society, ecosystems, cultural heritage, and the environment.
- d. Accountability for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts."

(ALLEA - All European Academies, 2017)

- 8. The researcher is responsible for the integrity, quality, conscientiousness and transparency of research.
- 9. The researcher must be appropriately informed about the project, funding, aim of the research, methods and his duties.
- 10. In case the researcher doesn't feel confident with the available information, he/she is responsible to gain knowledge and to involve the task leader and/ or the project leader.
- 11. The researcher is responsible for the wellbeing of the participants and must protect their rights, interests, sensitivities, and privacy. Further, he/she must respect their anonymity in regard to the GDPR.
- 12. The relationship between the researcher and the participant must be trustful and morally unobjectionable.
- 13. Researchers must not be constrained to reach particular conclusions or to make any recommendations neither by members of the consortium, the scientific community or funders, nor by one or more participants or society. In such a case, the project leader and the ethics supervisor have to be promptly informed.
- 14. The researcher as well as the consortium has to guarantee the safety of the participants.
- 15. In the case of an ethical dilemma of the researcher, the ethics supervisor has to be involved (see also 3.2.1).

#### 3.2.3 Participants

- 16. The participants must take part voluntarily and free from any coercion.
- 17. The participants' confidence as well as their wellbeing during the involvement must be the prior and highest good for the researchers and the consortium.
- 18. The project consortium and especially the researchers on-site are responsible for the physical, social and psychological wellbeing of the participant and to ensure that it is not adversely affected by the research.
- 19. Vulnerable persons must be particularly protected.

#### 3.2.4 Informed Consent

- 20. The informed consents must be written in the language of the country where the research activity will be conducted.
- 21. At the very beginning of each involvement, each participant must be informed by the researcher about the project, the aim of research, the methods and if requested by the participant also about other information concerning the research and the project (e.g., funder) that is not confidential.
- 22. The researcher is responsible to make sure that the participant understood the given information about the project, the aim of research, the methods and if requested also about other information concerning the research and the project.
- 23. The researcher has to obtain an informed consent in written form, confirmed by the participant by signature. Therefore, the informed consent must contain:
  - a. Signature of Participant
  - b. Date
- 24. The informed consents must contain at least the following information, based on the GDPR (2016):
  - a. Personal details and given statements will be treated in strict confidence and will be processed in an anonymous manner.
  - b. The purposes of the processing for which the personal data are intended as well as the legal basis for the processing.
  - c. The existence of automated decision-making, including profiling and, at least in those cases, meaningful information about the logic involved, as well as the significance and the envisaged consequences of such processing for the data subject.
  - d. The categories of personal data concerned.
  - e. The period for which the personal data will be stored, or if that is not possible, the criteria used to determine that period.
  - f. That the decision of rejecting a question as well as to terminate the research activity will not have any consequences for the participant.
  - g. That at any point during the involvement, the participant has the possibility to terminate the research activity and the right to withdraw consent at any time, without affecting the lawfulness of processing based on consent before its withdrawal.

- h. The identity and the contact details of the controller and, where applicable, of the controller's representative.
- i. Where applicable, the fact that the controller intends to transfer personal data to a third country or international organisation and the existence or absence of an adequacy decision by the Commission, or in the case of transfers referred to in Article 46 or 47, or the second subparagraph of Article 49 (1), reference to the appropriate or suitable safeguards and the means by which to obtain a copy of them or where they have been made available.
- j. The recipients or categories of recipients of the personal data, if any.
- k. The contact details of the data protection officer, where applicable.
- I. The right to lodge a complaint with a supervisory authority.
- m. The existence of the right to request access to and rectification or erasure of personal data or restriction of processing concerning the data subject from the controller or to object to processing as well as the right to data portability.

25. The participant must receive a copy or duplicate of the informed consent.

#### 3.2.5 Data

- 26. Data will be processed only in an anonymized manner (e.g., ID-Code). Therefore, questionnaires, interview guidelines and other used instruments must not contain questions where answers could reveal the participant's identity alone or in combination with other answers.
- 27. The anonymity and privacy of participants must be respected. Personal information must be kept confidential. Guarantees of confidentiality and anonymity given to the participants must be honored, unless there are clear and overriding reasons to do otherwise.
- 28. In case the participants must be registered e.g., for using geo trackers, they must not be registered with their name. For instance, an ID-code will be applicable instead. That guarantees the anonymity of the participant and further, the ID-code helps to match answers of questionnaires and the data presented by the geo tracker.
- 29. The participants themselves have sovereignty over their data. In case the participant requests the deletion of his/her data, this has to be done promptly.
- 30. It is strongly recommended to add rules 33., 34. and 35. to the informed consents.
- 31. Only information pertinent to the research is permitted to be collected.
- 32. All researchers have the duty of confidentiality in regard to collected data.
- 33. The integrity of processed and published data must be ensured by the researchers and the project consortium.
- 34. E.g., for the purpose of proofing tasks of the PALAEMON partners, data can be handed out in original form (e.g., filled out questionnaires) to the national funding agencies of the countries where the research will be conducted and also to the European Commission as funder. They are the only institutions with this special right.
- 35. Data that are presented by the participant must be treated with care:

- a. Participants must be informed in which way the data could be used (see also 3.2.4).
- b. Participants must be informed on who has the data sovereignty (see also 3.2.4).
- c. The project consortium is responsible for risk management: to avoid inconveniences to and damage of the personal integrity of the participants and the researcher, appropriate measures must be taken.
- d. Appropriate measures must be taken to protect the presented data by the technical partners and the consortium.
- e. Appropriate measures must be taken to store data in a secure manner.
- f. Every access to the data must be protocolled. Every registration must contain the name of the researcher who had access, his/her signature, and the date and the description of accessed data. Every partner who has access to the data must keep the minutes.
- g. Bodies that are not project partners but whose involvements are necessary for research purpose, e.g., coast guard services, could have access to data. This requires additional agreement by the participant in the informed consent.

#### 4 Analysing ethical issues and deriving measurements

The Ethic Evaluation Standard for Security Research (EESSR), a model for identifying and dealing with ethical issues during all technical development phases - described in D1.7 "Ethics State-of-the-Art Report" (PALAEMON, 2020) - will be applied regularly.

#### 4.1 MEESTAR as a starting point

MEESTAR (Model for the Ethical Evaluation of Socio-Technical ARrangements) is an analysis framework for the ethical evaluation of the implementation of assistive technologies in life worlds ("Lebenswelten"). The instrument is based on the work of Manzeschke, Weber, Rother and Fangerau, who developed MEESTAR in a study accompanying Active and Assisted Living (AAL) projects (2013).

Its values are to make the topic of ethics more concrete and to present an easy and useful guideline on how to catch ethical aspects that need to be taken into account continually from a very early stage of a technological development for the health care sector. MEESTAR describes preconditions that are crucial for the development and practicability of systems from an ethical point of view. Furthermore, the instrument supports the identification of possible undesired ethical consequences and fosters the finding of solutions to avoid these outcomes.

Ethical areas of tension in this context and where MEESTAR can be deployed are diverse; for example: Does the technology possess intrinsic disciplinary measures? Does the socio-technical system cause burden or relieve for users? Does the system foster autonomy, does it give assistance and what happens if malfunctions occur? Does the technology overrule equal chances? Does the use of the technology encourage the change of individual and societal structures of welfare?

For answering these and further questions from an ethical point of view, topics related to the (planned) development are categorized and brought in line with the dimensions for the ethical assessment (x-axis) and, in addition, in combination with the levels of impact (z-axis) and in regard of the users' perspectives analysed.



Figure 1 MEESTAR Model (Manzeschke, Weber, Rother, & Fangerau, 2013)

#### 4.2 EESSR

The safety and security sector is an area where many innovations accompany the new technologies that are being implemented. In this area, the effective interaction between humans and technologies is crucial for life-saving and avoiding burden - for everyone involved. In this context it's not only important that things work, but also that ethical aspects are taken into account at a very early stage of development (planning phase) and also continually during the development; also for meeting the needs of an ideology of solidarity that this sector implies. It is necessary to have assessment tools that are easy to use and – more importantly – that make a systematic analysis possible.

However, in the past in the safety and security sector, such an easy-to-use model for analysing ethical aspects in technological development-phases was missing but needed.

Therefore, the evaluation tool MEESTAR was adapted for this area by Georg Aumayr (JOAFG, 2019), who is experienced in both fields, ethics for AAL as well as safety and security, and gave the amended instrument its name: Ethic Evaluation Standard for Security Research (EESSR).

Like MEESTAR, EESSR fosters the identification of ethical issues in advance or during the development and supports to take them into account in further phases as technology systems and/ or its elements must be sketched and subsequently discussed in regard to their influence on ethical matters. Furthermore, it enables the users to structure, assess, and allocate ethical issues to relevant tasks, and facilitates a reflexion and the visualising of ethical aspects for relevant finished tasks. However, most importantly and wide-ranging, the developers get sensitized to the topic and a common understanding about the vision and the importance of ethical considerations is created.

The following main questions define the application areas of the EESSR, support the understanding and make its necessity more transparent:

- Are the used technologies or related research processes critical from an ethical point of view?
- Which specific ethical challenges arise from developing, testing, and using the technology?
- Can the defined ethical issues/ problems be mitigated or even solved? If yes, which potential solutions are possible?
- Are there ethical issues so critical that development, testing and/ or using the system has to be stopped?
- Have unexpected critical problems occurred, which have not been assessable before? How do you deal with them?
- Which aspects and functionalities need to be considered explicitly from an ethical point of view when developing, testing, and using the system?

#### 4.3 Structure of EESSR



Figure 2 EESSR

As Figure 2 points out, it is all about the grades of the ethical relevance that are set in the centre and divided into 4 stages:

Stage I	Its use is completely harmless from an ethical viewpoint.
Stage II	Its use is ethically sensitive but this can be compensated for in practice.
Stage III	Its use is ethically extremely sensitive and requires either permanent monitoring or its introduction should be questioned.
Stage IV	Its use should be opposed from an ethical viewpoint.

Table 1 Ethical Stages

Each description of the stages gives a hint of how to deal with the allocated issue in the upcoming steps of the development. The aim is to reach Stage I for each element; only then the technology system is marketable from an ethical point of view.

At the top of the outer circle, the dimensions of the ethical assessment are placed. The ethical questions and issues that come up in the discussion must be categorized according to these.

To create a common understanding of what these dimensions include, some examples for each term are presented below:

#### Table 2 Dimensions of EESSR

Availability	Readiness, capability, standby, attendance
Self-image of the User	Self-assessment, weaknesses and strengths, skills
Participation	Teamwork, cooperation
Ability for Judgement	Mental stability, knowledge, training
Personal Safety	Self-responsibility, control
Care and Support for Others <sup>3</sup>	Helpfulness, solidarity, altruism

In the outer circle of the figure, three users (victim, responder and responsible) are listed. When applying EESSR, the perspectives of those three actors must be assessed. Furthermore, the strategic, tactical and operative layer build the levels of impact. All three levels must be taken into account and the ethical questions discussed for each level.

At very first sight – especially when looking at Figure 1 MEESTAR Model (Manzeschke, Weber, Rother, & Fangerau, 2013) and Figure 2 - MEESTAR and EESSR seem to be quite different. However, in fact both models are very similar: of course, it was necessary to adopt the wording for the safety and security sector. Further, the figure of EESSR additionally displays the perspectives that need to be considered. However, the application could be taken over for EESSR and is the same as for MEESTAR. This was important, as therefore it can be expected that EESSR works in the same manner as MEESTAR, with a systematic discussion on ethics accompanying the entire technological development.

#### 4.4 Application of EESSR

In a first step, **ethical questions and issues** that could be relevant and are related to the technology must be identified and described. Ideally, this should be done in an interdisciplinary group of experts who are needed for and involved in the development. By this, it is guaranteed that all professional perspectives are covered.

Secondly, the ethically relevant issues that came up in the prior discussion have to be **categorized to the dimension** of the ethical assessment (availability, self-image, participation, etc.). It may occur that one or more issues could fit into more than one category. In this case, the main dimension represented must be identified and chosen.

In the next step, the ethical questions and issues need to be **categorized according to the layers** of EESSR:

- strategic: means long-term planning for preventing negative consequences
- tactical: means the controlling and planning of actions
- operational: means working at the place of action

<sup>&</sup>lt;sup>3</sup> Cancelled after the 1<sup>st</sup> EESSR-Workshop for PALAEMON/ EESSR - Proof of Concept (p. 5)

Then their ethical gravity according to the four stages have to be evaluated.

The last step is then, to **allocate the findings to the phases** of the development and its tasks for keeping them in mind and for considering them in all processes of the development.

Like the usage of MEESTAR, EESSR should be applied in an early phase of the technical development at first and then periodically discussed in workshops across the development according to its state.

By doing this, it should be ensured that the ethical issues and questions are adjusted. However, EESSR-results must be treated like a living document and revised regularly!

#### 4.5 EESSR-Timetable

EESSR is a tool that must be applied regularly for actualising ethical issues, for:

- up-/downgrading within the stages of an already identified issue, and
- identification of new ethical issues.

Therefore, it is recommended to hold interdisciplinary workshops at minimum every 6 months and additionally after each reached milestone (MS) of the project (MS1, 2 and 13 are excluded, as technological developments are not dependant). To make it practicable, if both the end of a 6 months lasting period and a milestone took place within a couple of weeks, only one workshop for both events will be held.

For PALAEMON, the following time table concerning EESSR-workshops results:

Table 3 Time table for PALAEMON workshops

1 <sup>st</sup> EESSR workshop	December 2019	EESSR Kick Off	Done
2 <sup>nd</sup> EESSR workshop	April 2020	6 months period, MS4 and MS5	Done
3 <sup>rd</sup> EESSR workshop	August 2021	6 months period and MS9	Done
4 <sup>th</sup> EESSR workshop	December 2021	6 months period, MS3, MS6 and MS8	Done

#### 4.6 1<sup>st</sup> EESSR-Workshop for PALAEMON/ EESSR - Proof of Concept

Date: 10.12.2019

Participants: Georg Aumayr, Sofia Kirilova, Gudrun Ringler, Gabriele Salomon

In this first workshop – held in German – EESSR was applied for the project PALAEMON with the knowledge about the project and used technology at this point in time, which is comparable with an early phase of technical development (as mentioned above).

However, this first workshop for PALAEMON was also conduced as Proof of Concept of EESSR, as it was never applied before. Therefore, besides the identification of ethical issues

of PALAEMON, of course also the ethics tool by itself was scrutinized: gaps, lacks, and needed corrections in regard to wordings and the procedure, which was adapted from MEESTAR, had to be identified.

The participants were an interdisciplinary team, consisting of experts in social science, health care, and safety and security, and all are familiar with the project PALAEMON. Furthermore, all participants were able to acquire knowledge over several years about data security, data protection and especially the Data Protection Regulations of the EU, as it is part of their daily work, and, furthermore, are trained in the application of MEESTAR in Active and Assisted Living-projects.

Within the introduction phase, a discussion occurred concerning the nominated perspectives: who - in person - is meant by "victim, responder and responsible" in the setting of maritime shipping?  $\rightarrow$ 

- Victims are passengers but also staff members, who are no seafarers and, due to this, not (well) trained and without seafarers' responsibilities during the evacuation process (e.g., restaurant employees)
- Responders are seafarers who should be well trained and who are familiar with the evacuation process. They act on-site on basis of the captain's commands, report to the captain, have to deal with victims' concerns and worries, are the helping hand in need, point the way and guide the victims.
- In the maritime setting, the responsible is the captain of the ship. He/she is in contact with the coastguard and makes decisions on the basis of his/ her knowledge and experience and on information given by the coastguard, by seafarers on the ship, and by the nautical instruments. The captain is responsible for all processes on the ship and of the evacuation.

Furthermore, the layers and their persons in charge needed to be defined for the maritime setting:

- The operative layer was attributed to responders (seafarers). It consists of happenings which are on-site and immediate.
- The time component of the tactical layer is seen as mid-term. Players of this layer are the captain, the coastguard and if applicable other institutions involved in the evacuation process, which need to make decisions that (might) affect everything that follows.
- The strategic layer is based on a long term perspective and consists of legislators and organisations presenting guidelines. More so than in the other layers, here, experiences from the field can be considered and seen as lessons learned in the sense of prospective prevention.

In accordance with the MEESTAR-procedure, the participants were prompted to identify issues related to the technology that could be ethically relevant for the project. As drones were a technology intended for the project in this early project phase, the participants started with a critical analysis of its use in evacuation situations. Consequently, issues related to other project-components came up, were discussed, and put onto paper as well.

In the next step, the generated issues were categorized to the dimensions. For this, the examples named in Table 2 proved to be very helpful for a common understanding and staying in line with the meaning of the categories. However, one dimension turned out to worded in an unclear way when the issues were categorised along the layers: by using "Care and Support for Others" it was complicated to keep the perspective in mind and to whom this term

referred to. Therefore, the term was shortened and "for Others" was removed. "Care and Support" is the remaining term that already includes the attention for others.



Figure 3 Compiled Categorizations (picture by G. Aumayr)

At last, the following results were generated in this first workshop:

#### 4.6.1 Stage I:

No issue.

#### 4.6.2 Stage II:

- Drones might not be ready for use (e.g., low/ no battery). (Dimension of Availability; operational)
- For tactical purposes, data generated by drones might be sent to the captain and to the coastguard. The ethical issues of data protection, data storage, data analysis and further data usage must be kept in mind. (*Participation; tactical*)
- Operating drones poses a risk of injury (e.g., when crashing). (Personal Safety; operational)
- Ground drones might hinder the evacuation. (Personal Safety; tactical)
- The use of two drones at the same time could produce a mutual obstruction. (*Personal Safety; tactical*)
- A previous rescue of illegals and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation; no equal treatment by the legislator and operating bodies. (*Care and Support; strategic*)
- With the application of sensor smart bracelets, victims have no possibility of selfdetermination in regard to their observation besides putting it down, and therefore the bracelets are at high risk of getting lost. (Ability of Judgement; operational)
- If drones are navigated fully automatically via autopilot, the drones can't perform individual flights and sights which may be needed for this evacuation case. (Ability of Judgement; tactical)

#### 4.6.3 Stage III:

- The application of drones is weather-dependent; no storm or strong precipitation as preconditions. (*Dimension of Availability; tactical*)
- With the application of drones, victims and also responders have no possibility of selfdetermination in regard to their observation.<sup>4</sup> (*Dimension of Self-Image; operational*)

#### 4.6.4 Stage IV:

No issue.



Figure 4 Results of 1<sup>st</sup> Workshop (picture by G. Ringler)

#### 4.6.5 Conclusion:

In conclusion, in this very first EESSR-workshop, a few ethical issues were identified, and almost all were classified as Stage II. As this stage presents ethical issues that are sensitive but can be compensated, at this point in time these issues might have no bigger influence on the project. Nevertheless, it is important to be aware of them and keep them in mind, as the project team needs to modify for a relocation of all issues to Stage I in the end.

Two ethical issues are in Stage III. This means that these issues are extremely sensitive, require permanent monitoring, or their introduction must be questioned. In practice this also means that it is not possible to easily compensate for the problem as it was identified at this point in time.

No ethical issue was classified in Stage IV. Therefore, the project and its aims are currently not at risk to not be realized.

Furthermore, besides one issue, all identified ethical issues are categorized as tactical or operational. Only one is allocated to the strategic layer. This is also very positive for the project

<sup>&</sup>lt;sup>4</sup> This issue was relocated from Stage II to Stage III as it cannot be compensated in practice (as stage II claims).

as almost all ethical issues can be complied within the current legislations/ recommended guidelines.

However, the workshop also showed that in this early phase of the project, the application of technologies is not well defined yet. Therefore, it is recommended to conduct the next EESSR-workshop after a refinement.

As conclusion of the EESSR-Proof of Concept, it can be said that the instrument is valid and serves its purpose.

#### 4.7 2<sup>nd</sup> EESSR-Workshop for PALAEMON

Date: 17.04.2020

Participants: Georg Aumayr, Sofia Kirilova, Gudrun Ringler, Gabriele Salomon, Veronika Simanko.

Like the first, the second workshop was held in German, moderated by Gudrun Ringler. Furthermore, the same interdisciplinary team consisting of experts in social science, health care and safety and security and who are all familiar with the project PALAEMON participated; an expert in the field of behavioural and cognitive biology, Veronika Simanko, came along as well this time.

The second workshop was conducted in a very special situation: in the shutdown-phase recommended by the Austrian (and other) government(s) in the (first) COVID-19 wave. As at that time the participants were encouraged to work from home, the workshop wasn't held in a face-to-face meeting but online by using a video conference system (ZOOM meeting; no interruptions recognised).

Firstly, the EESSR model, its steps and aims, but also the results from the first workshop were presented.

Afterwards, the team (re-)defined the perspectives<sup>5</sup> for the project:

- Victims: passengers, crew members (not trained)
- Responders: trained seafarers, **coastguard, sea rescue**
- Responsibles: Master (captain), coastguard.

As the EESSR model should support a structured identification of ethical issues in regard to used technologies, these needed to be talked about. However, at this point in time, the issues regarding the used technologies for the project in the future were countered but not fixed in detail. Based on information from the technological work package-leader of PALAEMON in this EESSR workshop, the following technologies were considered:

- UAVs (Unmanned Aerial Vehicles; especially drones),
- smart cameras (without face recognition),
- tracking systems (e.g., smart bracelets),
- technologies for in-time analysis,
- technologies for decision making/ recommendation of evacuation strategy.

<sup>&</sup>lt;sup>5</sup> Roles, which were added in the second workshop, are highlighted by **bold letters**.

The participants started with a critical analysis of its use in evacuation situations. By doing this, issues related to other project-components came up, were discussed, and filled in a prepared table (visible for all participants by using a Power Point presentation on a shared screen). Also, the results from the first workshop were discussed once more and - if needed – revised.

In the next step, all generated issues were categorized to the dimensions; already existing and/ or adapted issues were checked in regard of their allocation. Afterwards, the ethical issues were labelled by using the letters "o" for the operative layer, "t" for the tactical layer and "s" for the strategic layer. In a next step, each issue was thought through once again and assigned to the Stages I-IV describing the severity by using the following colour code: green for Stage I, yellow for Stage II, orange for Stage III and red for Stage IV. As can be seen below, no ethical issue was allocated to Stage IV (red)!

Below, the results from this second workshop – also in comparison with the first workshop – are presented:

Results from the second workshop (issues in addition to the results of the first workshop as well as changes are written in **bold** letters):

#### 4.7.1 Stage I:

- Seafarers might not be trained in using drones. (Ability of Judgement; strategic)
- For compliance in regard of wearing the smart bracelet, information is needed/ must be given to passengers but also to staff members and seafarers (all wearers). (Ability of Judgement; strategic)
- Bridge needs to be trained and know the technological system very well for handling it also in stressful situations. (Ability of Judgement; strategic)
- Impaired persons: measures for evacuations could be taken beforehand if they are tracked especially: e.g., the smart bracelet gives additional information about the impairment.

For placing this issue in Stage I, this additional information must not be visible for others (for example, the smart bracelet must not be in another colour)! (Care and Support; tactical)

#### 4.7.2 Stage II:

- Drones/ smart cameras/ smart bracelets might not be ready for use (e.g., low/ no battery/ defective). (Dimension of Availability; operational)
- For tactical purposes, data generated by drones/ smart cameras/ smart bracelets might be sent to the captain and to the coastguard. The ethical issues of data protection, data storage, data analysis and further data usage must be kept in mind. (*Participation; tactical*)
- Operating drones poses a risk of injury (e.g., when crashing). (Personal Safety; operational)
- Ground drones might hinder the evacuation. (Personal Safety; tactical operational)
- The use of two drones at the same time could produce a mutual obstruction. (Personal Safety; tactical)
- If drones are navigated fully automatically via autopilot, the drones can't perform individual flights and sights which may be needed for this evacuation case. (Ability of Judgement; tactical)
- Fully automated smart cameras don't allow individual sights. (Ability of Judgement; tactical)

- <u>All</u> persons on board (also staff members and seafarers) should wear smart bracelets. (*Self-Image of User; strategic*)
- Blind trust in technology bears an ethical issue: e.g., in an evacuation situation, only wearers of smart bracelets could be evacuated, others not seen and therefore not cared for. (*Care and Support; tactical*)

#### 4.7.3 Stage III:

- A previous rescue of illegals and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation; no equal treatment by the legislator and operating bodies. (*Care and Support Personal Safety; strategic*) (shifted from Stage II)
- The application of drones is weather-dependent; no storm or strong precipitation as preconditions. (*Dimension of Availability; tactical*)
- With the application of drones/ smart cameras/ smart bracelets, victims and also responders have no possibility of self-determination in regard to their observation. (*Dimension of Self-Image Personal Safety*; operational)
- With the application of sensor smart bracelets, victims **and responders (seafarers)** have no possibility of self-determination in regard to their observation besides putting it down, and therefore the bracelets are at high risk of getting lost. (Ability of Judgement; operational) (shifted from Stage II)

#### 4.7.4 Stage IV:

No issue.

#### 4.7.5 Conclusion:

In the second EESSR-workshop of PALAEMON, several ethical issues were identified in addition to those already discussed in the first workshop – 4 in Stage I and 3 in Stage II. This can be attributed to the progress of the project and thereby a deeper insight in the technologies that might be used in PALAEMON. Further – also explainable with the project progress - ethical issues concerning the application of drones (in all stages) are complemented with the use of smart cameras and smart bracelets.

In the discussion, two additional essential questions occurred, which are forwarded to and asked the consortium but especially the technological partners:

 Is it already planned/ should the consortium think about, that information sent by the smart bracelets could be merged with information given by the passenger/ wearer before entering the ship? E.g., for impaired persons and their evacuation, this could be useful (for example that equipment like a wheel chair is needed for transportation).

Availability	Self-image of User	Participa- tion	Ability of Judgement	Personal Safety	Care and Support
Drones/		Data	Wristbands:	Drones as	Blindes
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cameras/wr		by drones:	determinatio	o``	auf Technik?
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not ready		storage,	putting down		Wristband-
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			.0		
Weather-	Alle sich an	Data	Full	Ground	Impaired
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drone-	Befindenden	by <b>smart</b>	drones/	hinder	Maßnahmen
application.T	sollten ein	cameras:	smart	evacuation.	bei
	Wristband	exchange,	cameras →	(T <b>→O)</b>	Evakuierung
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		useage. T			
			For	illegal/	
			compliance	refugees:	
			(wristband):	affect	
			information	evacuation.	
			needed. S	S (von gelb)	
			Brücke	Wristbands:	
			muss sich	no self-	
			perfekt mit	determinatio	
			den	n besides	
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				. 0	

Table 4 Table of allocated ethical issues developed in the 2<sup>nd</sup> workshop in original languages (EN and GER for anchor examples in the evaluation)

2. Is it already planned that <u>all</u> persons who are on board (also including staff and nautical crew members) wear smart bracelets? (See also the ethical issue in Stage II this question relates to)

Persons on board who should be equipped were defined as passengers, staff members (no seafarers), but also seafarers.

Two issues in the first workshop located in Stage II were relocated to Stage III as it cannot be compensated in practice (as stage II claims). Therewith they became extremely sensitive and require permanent monitoring like all 4 items in Stage III.

Further, differently to the outcome of the first workshop, in this second workshop, ethical issues were also allocated in Stage I (its use is completely harmless from an ethical viewpoint), but – like in the first workshop – no issue was categorized in Stage IV. This is one of the most important outcomes for the project, since if something had been allocated to this stage, the use of the technology should have been opposed from an ethical viewpoint.

However, in this workshop, four ethical issues where categorized as strategic. One concerns the information that might be given to passengers for their compliance. Two of them relate to trainings for staff members/ seafarers needed for the application of PALAEMON's technology. Another one (already identified in the first workshop) relates to strategies with refugees/ illegals on board and needs to be clarified by the legislator/ operating bodies. Therefore, as the decisions must be made on the strategic level, the implementation in the future is dependent on stakeholders and policy makers.

Nevertheless, until now several ethical issues were identified which need to be taken into account in the next steps of PALAEMON and are also crucial for further device/ technology-decisions.

#### 4.8 3<sup>rd</sup> EESSR-Workshop for PALAEMON

Date: 30.04.2021

Participants: Georg Aumayr, Constanze Geyer, Andreas Peer, Gudrun Ringler, Sabrina Scheuer.

Like the previous workshops, the 3<sup>rd</sup> EESSR Workshop for PALAEMON was held in German, again moderated by Gudrun Ringler.

This time some participants changed, but nevertheless the team was again interdisciplinary and consisted of experts in ethics, social science, health care and safety and security, risk prevention and disaster management, as well as in first responder leadership.

All participants were familiar with the project PALAEMON.

The 3<sup>rd</sup> workshop was again held online using Zoom meetings (no interruptions recognised) and was recorded.

As the EESSR model should support a structured identification of ethical issues in regard to used technologies, these needed to be described and explained for discussion. Based on information presented in PALAEMON's deliverables and the mid-term report in this EESSR workshop, the following technologies<sup>6</sup> were considered:

- UAVs (Unmanned Aerial Vehicles; especially drones) with <u>Ground Control Station</u> (GCS): for an automated and manually operated navigation. The GCS provides the tools to plan and monitor automated missions executed by the UAV; UAVs may assist the ship's crew in camera-oriented missions as search and rescue in Man Over Board (MOB) situations, damage assessment or scouting (i.e., to help locate people in the sea). It is selectively used when a situation demands the use of the UAVs.
- Smart cameras (without face recognition) with <u>Graphical User Interface (GUI)</u>: to monitor people in indoor areas: long corridors, large open indoor areas and deck stairs (e.g., overcrowded corridors, direction of flows of persons. Two modes: emergency mode and normal operation mode.
- Tracking systems (e.g., smart bracelets for passengers and crew members),
- <u>Passengers Mustering and Evacuation Automation System (PaMEAS)</u> (before: technologies for decision making/ recommendation of evacuation strategy)
- Augmented Reality Glasses: provides environment information, evacuation tactics and real time communication between crew members (video communication)
- "Technologies for in-time analysis" was dropped.

Secondly, the EESSR model and its steps and aims were presented for a common understanding.

Afterwards the team (re-)defined the perspectives<sup>7</sup> for the project:

- Victims: passengers, crew members (not trained); trained passengers like doctors and members of the police and the military who will react specially because of their education/ training in emergency cases (by law: passengers may only act as passengers).
- Responders: trained seafarers, coastguard, sea rescue
- Responsibles: Master (captain), coastguard

As basis for the ethical discussion in this third workshop, an Excel table was used (and during the Zoom meeting displayed to the participants by screen sharing), where the results from the second workshop were already filled in. The table's structure consisted of columns specifying the EESSR-steps. Further, the identified issues were numbered for an easier finding (the present report vs. the Excel table).

The participants started with a critical analysis of the technologies' use. By this, the results from the second workshop were discussed once more and - if needed – revised and/or amended.

After the definition/revision/modification of each individual ethical issue, they were categorized into dimensions. Furthermore, already existing and/or adapted issues were checked in regard to their allocation. Afterwards, the layer(s) was/ were discussed for each ethical issue. In a

<sup>&</sup>lt;sup>6</sup> Technologies and information, that were added or concretised in the third workshop, are highlighted in **bold letters.** 

<sup>&</sup>lt;sup>7</sup> Roles, which were added in the third workshop, are highlighted by **bold letters**.

next step, each issue was thought through once again, and measures were defined and assigned to the Stages I-IV describing the severity.

Below, the results from this third workshop – also in comparison with the second workshop – are presented<sup>8</sup>:

#### 4.8.1 Stage I:

(1) Seafarers might not be trained in using drones. **Measure: Adequate training.** (Ability of Judgement; strategic)

(2) For compliance in regard to wearing the smart bracelet, information is needed/ must be given to passengers but also to staff members and seafarers (all wearers). **Measure: Giving information for compliance** (Ability of Judgement; strategic)

(4) Bridge needs to be trained and know the technological system very well for handling it also in stressful situations. **Measure: Adequate training.** (Ability of Judgement; strategic)

(5) Impaired persons: measures for evacuations could be taken beforehand if they are tracked especially: e.g., the smart bracelet gives additional information about the impairment. **Measure: Personal details in regard of handicaps and disabilities must be given at the point of time of booking.** This additional information must not be visible to others (for example, the smart bracelet must not be in another colour)! (*Care and Support; tactical*)

#### 4.8.2 Stage II:

(3) When going on-board, passengers and crew members are obliged to always wear the smart bracelets. The tracking function will then be active only in emergency cases (controlled by the ship's bridge). Measure: Definition of those emergency cases, in which the function needs to be active; obligation and information at the point in time when the passengers book the trip. (*Personal Safety; strategic*)

(6) Drones/ smart cameras/ smart bracelets might not be ready for use (e.g., low/ no battery/ defective). **Measure: adequate service and care. On the ship's bridge, an error message or the information that the device doesn't send a signal anymore could be presented.** (*Dimension of Availability; operational*)

(7) For tactical purposes, data generated by drones/ smart cameras/ smart bracelets might be sent to the captain and to the coastguard. *Measure:* The ethical issues of data protection, data storage, data analysis and further data usage must be kept in mind. **All persons on board must be informed about the data management.** (*Participation; tactical*)

<sup>&</sup>lt;sup>8</sup> Issues in addition to the results of the second workshop as well as changes are written in **bold letters.** Numbers in front refer to elements in Table 6 in the Annex.

(8) Operating drones poses a risk of injury (e.g., when crashing). (Personal Safety; operational)

(9) Operating drones poses a risk of injury (e.g., when crashing). Measure: Adequate testing of sensors; drones must fly in distance to persons and the ship as requirement *(Personal Safety; strategic)* 

(10) Ground drones might hinder the evacuation. (Personal Safety; operational)9

(11) The use of two drones at the same time could produce a mutual obstruction. **Measure:** In a semi- or full-automated operation, this shouldn't be any problem anymore from a technical point of view. (*Personal Safety; tactical*)

(12) If drones are navigated fully automatically via auto pilot, the drones can't perform individual, maybe for this evacuation case needed, flights and sights. (Ability of Judgement; tactical)<sup>10</sup>

(13) Fully automated smart cameras don't allow individual sights. **Measure: Requirements** for the technology are the existence of controllability/ the option of taking a corrective action by users. (Ability of Judgement; tactical)

(14)<u>All</u> persons on board (also staff members and seafarers) should wear smart bracelets. (Self-Image of User; strategic)<sup>11</sup>

(15) Blind trust in technology bears an ethical issue: e.g., in an evacuation situation only wearers of smart bracelets could be evacuated, others not seen and following not cared for. (Care and Support; tactical)<sup>12</sup>

(16) A previous rescue of illegals and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation; no equal treatment by the legislator and operating bodies. Measure: Illegals and refugees must be equipped and receive information when they board. (*Care and support; operational*)

<sup>&</sup>lt;sup>9</sup> Ground drones are not part of the project anymore.

<sup>&</sup>lt;sup>10</sup> Drones can be controlled manually and need to meet the application need. This is already defined as requirement in the interim report of the first project period (interim report 1).

<sup>&</sup>lt;sup>11</sup> All persons on board have to wear smart bracelets. This is already defined.

<sup>&</sup>lt;sup>12</sup> Information must be given when the trip will be booked. See Ethical Issue (3)

(19) The application of drones is weather-dependent; no storm or strong precipitation as preconditions. **Measure: Definition when, when not and which drone can be used. Another action strategy has to be chosen if the drones are not available. The drone-status must not be the decision-making tool.** (*Availability for Judgement; tactical strategic).* 

#### 4.8.3 Stage III:

(17) A previous rescue of illegals and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation; no equal treatment by the legislator and operating bodies. Measure: Adequate preparation in advance. (Availability; strategic)

(18) A previous rescue of illegals and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation; no equal treatment by the legislator and operating bodies. *Measure:* **Legislation and its implementation in established practice.** *(Personal Safety; strategic)* 

(20) The application of drones is weather-dependent; no storm or strong precipitation as preconditions. **Measure: Another action strategy has to be chosen if the drones are not available.** (*Availability Ability of Judgement; tactical*)

(21) By the application of drones/ smart cameras/ smart bracelets, victims and also responders have no possibility of self-determination in regard of their observation. **Measure: Implementation of the GDPR and Data management; mode for the emergency case** (*Personal Safety; operational*)

(22) • With the application of sensor smart bracelets, victims and responders (seafarers) have no possibility of self-determination in regard to their observation besides putting it down, and therefore the bracelets are at high risk of getting lost. **Measure: Two defined modes are needed; tracking should only be active in an emergency case. Obligation of wearing signed when the trip is booked.** (Ability of Judgement; operational)

(23) Misuse of data. Measure: GDPR, Data management. (Personal safety; strategic)

(24) Misuse of technology. Measure: Defined application modalities, persons in charge, responsibilities, control (e.g., 4 eyes principle). *(Personal safety; strategic)* 

4.8.4 Stage IV: No issue.

#### 4.8.5 Conclusion:

As the project reached an advanced status and the information concerning the implemented technology became more concrete in the last months, in this third EESSR-workshop, all ethical

issues were once more discussed, edited and complemented. Additionally, the discussion was also focused on measures that support the categorization along the EESSR-stages – in the end all ethical issues were completed with measures. Through this and maybe because of participants with other backgrounds than before, it also turned out that several ethical issues can be seen from several perspectives (roles) or need to be placed in more than one level. Therewith, the workshop participants agreed on listing the ethical issues affected more than once but with allocations to different levels and/or to different roles where needed.

Four of the ethical issues that were assumed from the 2<sup>nd</sup> workshop were completely deleted as they don't comply with the defined technology system at this status. In the end of the workshop, two additional ethical issues were identified – both in regards of misuse. It can be summed up that 20 ethical issues are identified at this point of time.

Like in the workshops before, no ethical issue was allocated to Stage IV. Consequently, this means that there is no need to question the project.

Four out of 20 ethical issues were categorized to Stage I. Three of them were allocated to the dimension of Ability of Judgement and can be solved with trainings and information. Additionally, all three belong to the strategic level. However, also the 4<sup>th</sup> issue belongs to the topic "information as measure", but was allocated to the tactical level and to the dimension of Care and Support.

In Stage II, most of the identified ethical issues, namely 13, can be found. Five of them belong to Personal Safety; the others are a mixture of all. Also, all of the levels are present in this stage. The ethical issues themselves in this stage mainly – except for one - concern the use of drones, smart cameras, and smart bracelets.

In Stage III, seven ethical issues are situated. Five of them are allocated to the dimension Personal Safety. Three issues out of the five can be addressed by legal regulations (measure).

It can be said that the identified ethical issues concern several implemented technologies, especially drones, smart cameras and smart bracelets, in similar degrees and – in the sense of EESSR – no planned technology presents a higher risk profile than others at this stage. Moreover, all ethical issues in all stages, allocated to several dimensions and levels, can be reduced or prevented by concrete measures. This fact allows a positive foresight for the project and PALAEMON as implemented system.

#### 4.9 4<sup>th</sup> EESSR-Workshop for PALAEMON

#### Date: 15.12.2021

Participants: Constanze Geyer, Gudrun Ringler, Sabrina Scheuer, Nadine Sturm.

Like in the previous workshops, this 4<sup>th</sup> EESSR-workshop was held in German, moderated by Gudrun Ringler, using the online conference tool "ZOOM" (without any interruptions and with a stable connection). Once more, an interdisciplinary team consisting of diverse experts (in Ethics and the MEESTAR model, safety and security and health care) who were knowledgeable of the project as well as the EESSR-model participated.

Nevertheless, supported by a Power Point presentation, the EESSR-model and the current project status were briefly presented and room for questions provided.

By this, the technologies aimed to be integrated in PALAEMON (Step 1 of 6 in the model) at this stage were discussed and compared with the technologies, which were used for analysis in the 3<sup>rd</sup> workshop.

PALAEMON 3. WS	PALAEMON 4. WS
Drones (UAVs): assist ship's crew in camera-	? Drones (UAVs): assist ship's crew in camera-
oriented missions; punctually used	oriented missions; punctually used
Smart Cameras	Smart Cameras
(monitor people – everyday- and emergency-	(people detection and – counter; video clips
modus)	recording for analyses)
Tracking System – Smart Bracelets	Smart Bracelets
(for passengers and crew; localize, establish	(show the path to a muster station; heartrate
evac routes, communication, emergency button)	transmission; emergency button)
Augmented Reality Glasses (giving realtime environment info, evacuation tactics and communication)	Augmented Reality Glasses (data collecting for analyses, communication)
Passenger Mustering and Evacuation	Passenger Mustering and Evacuation
Automation System (PaMEAS)	Automation System (PaMEAS)
	PaMEAS-App for AR glasses, Smartphones; for passengers and crew (real-time audio/video communication & records for analyses)
	Voyage Data Recorder (report generating system)

#### Table 5 Comparison of PALAEMON technologies 3<sup>rd</sup> WS vs. 4<sup>th</sup> WS

Table 5 illustrates the various changes and amendments (written in red) that have developed from the 3<sup>rd</sup> to the 4<sup>th</sup> EESSR-workshop. In conclusion, the main adaptions are:

- The application of drones is questioned.
- The functions of smart cameras, smart bracelets and AR-glasses were partly changed.

- The PaMEAS-App for AR-glasses and smartphones is a newly added component that supports real-time audio and video communication and records data for post-analyses.
- As a report generating system, the Voyage Data Recorder was implemented.

The aspect of data recording for analyses issues after the incident was given more importance and in consequence was included.

In the next step, the perspectives with the respective roles (outcome of the 3<sup>rd</sup> workshop) were looked at and supplemented (adaptions in **bold letters**):

- Victims: passengers, crew members (not trained); trained passengers like doctors and members of the police and the military who will react specially in emergency cases, because of their education/ training (by law: passengers may only act as passengers).
- Responders: trained seafarers, coastguard employees, sea rescue, master, ship officers (middle management)
- Responsibles: master (captain), coastguard's responsible persons, ship officers (middle management).

Then, the table of results of the 3<sup>rd</sup> workshop was presented (via screen sharing function of ZOOM) and the participants were asked to review them in context of the updated technological development. As time ran out, in the 4<sup>th</sup> EESSR-workshop for PALAEMON, not all ethical issues of the 3<sup>rd</sup> workshop were discussed / amended, but edited by the workshop-moderator afterwards and – in a second step – reviewed by the participants in the form of a feedback loop. This procedure affects the aspects listed from (16)-(24).<sup>13</sup>

The outcome is listed below in order of the allocated stages.

Newly added ethical issues have the numbers 25-33.

Additional words/ phrases/ sentences/ ethical issues are highlighted in **bold letters**.

Deleted words/ phrases/ sentences/ ethical issues of the 3<sup>rd</sup> workshop are crossed out.

#### 4.9.1 Stage I:

(1) Seafarers might not be trained in using drones. Measure: Adequate training **and certification that also clarifies responsibilities (as side effect)**. (Ability of Judgement; strategic)

(2) Neither passengers nor staff members or seafarers are given needed information in regards to wearing the smart bracelets and the respective compliance. Measure: Giving information for compliance using an informed consent discussion and form; additionally assuring that the passenger understood the information. (*Ability of Judgement; strategic*)

<sup>&</sup>lt;sup>13</sup> Numbers in front refer to elements in Table 7 in the Annex.

(4) Bridge is not trained and therefore doesn't know the technological system very well for handling it also in stressful situations. Measure: Adequate training **and certification that also clarifies responsibilities (as side effect)**. (Ability of Judgement; strategic)

(5) Impaired persons: measures for evacuations could be taken beforehand if they are tracked especially: e.g., the smart bracelet gives additional information about the impairment. Measure: Personal details in regard of handicaps and disabilities must be given at the point of time of booking. This additional information must not be visible for others (for example the smart bracelet must not be in another colour)! (Care and Support; tactical)

#### 4.9.2 Stage II:

(3) When going on-board, passengers and crew members are obliged to always wear the smart bracelets. The tracking function will then be active only in emergency cases (controlled by the ship's bridge). Measure: Definition of those emergency cases, in which the function needs to be active; obligation and information at the point in time when the passengers book the trip. (Personal Safety; strategic)

(6) Drones/ smart cameras/ smart bracelets might not be ready for use (e.g., low/ no battery/ defective). Measure: Adequate service and care. On the ship's bridge, an error message or the information could be presented that the device doesn't send a signal anymore. (*Dimension of Availability; operational*)<sup>14</sup>

(7) For tactical purposes, data generated by drones/ smart cameras/ smart bracelets might be sent to the captain and to the coastguard. Measure: The ethical issues of data protection, data storage, data analysis and further data usage must be kept in mind. All persons on board must be informed about the data management. *(Participation; tactical)* 

(8) Operating drones poses a risk of injury (e.g., when crashing). (Personal Safety; operational)

(9) Operating drones poses a risk of injury (e.g., when crashing). Measure: Adequate testing of sensors; drones must fly in distance to persons and the ship as requirement *(Personal Safety; strategic)* 

(11) The use of two drones at the same time could produce a mutual obstruction. Measure: In a semi- or full-automated operation, this shouldn't be any problem anymore from a technical point of view. *(Personal Safety; tactical)* 

<sup>&</sup>lt;sup>14</sup> This ethical issue correlates with issue (30)

(13) Fully automated smart cameras don't allow individual sights. Measure: Requirements faced by the technology are the existence of controllability/option of taking a corrective action by users. (*Ability of Judgement; tactical*)

(16) A previous rescue of illegals and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation; no equal treatment by the legislator and operating bodies. Measure: Illegals and refugees must be equipped and receive information when they board. *(Care and support; operational)* 

(19) The application of drones is weather-dependent; no storm or strong precipitation as preconditions. Measure: Definition when, when not and which drone can be used. Another action strategy has to be chosen if the drones are not available. The drone-status must not be the decision-making tool. (Availability for Judgement; strategic)

(26) In everyday life and in emergency cases, individual threshold in several situations must be interpreted: a higher heartrate detected by smart bracelets doesn't always mean "emergency". Measure: Check-back options must be given. (*Personal Safety; operative and strategic*)

(29) Pressure of wearing the smart bracelet: Without wearing a smart bracelet, it is not allowed to do the ship trip. Measure: Reasons and added value must be clearly communicated. Giving information for compliance using an informed consent discussion and form; additionally assuring that the passenger understood the information. (*Participation; strategic*)

(30) Malfunctions of the smart bracelet could occur. Measure: status report via PaMEAS if so; regular function controls/maintenance / quality control standards (*Availability;* operative and strategic)<sup>15</sup>

(31) For charging, the bracelets have to be removed from the user, which has the disadvantage that no data is collected during this time. Measure: Minimize need of charging; offering support of crew members for charging management. (Availability; operative and strategic)

(32) Smart glasses record data even before an emergency situation occurs. Data recording is very sensitive because of the limitation of passengers' privacy. Measure: Giving information for compliance using an informed consent discussion and form; additionally assuring that the passenger understood the information. (*Personal Safety; strategic*)

<sup>&</sup>lt;sup>15</sup> This ethical issue correlates with issue (6)

#### 4.9.3 Stage III:

(17) A previous rescue of illegals and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation; no equal treatment by the legislator and operating bodies. Measure: Adequate preparation in advance. (Availability; strategic)

(18) A previous rescue of illegals and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation; no equal treatment by the legislator and operating bodies. Measure: Legislation and its implementation in established practice. *(Personal Safety; strategic)* 

(20) The application of drones is weather-dependent; no storm or strong precipitation as preconditions. Measure: Another action strategy has to be chosen if the drones are not available. *(Ability of Judgement; tactical)* 

(21) With the application of drones/ smart cameras/ smart bracelets/ AR glasses/ PaMEAS App, victims and also responders have no possibility of self-determination in regard to their observation. Measure: Application of each single device / software must be questioned in the sense of the cost-benefit factor. Implementation of the GDPR and data management; mode for the emergency case. (*Personal Safety; operational*)

(22) With the application of sensor smart bracelets, victims and responders (seafarers) have no possibility of self-determination in regard to their observation besides putting it down, and therefore the bracelets are at high risk of getting lost. Measure: Two defined modes are needed; tracking should only be active in an emergency case. Obligation of wearing signed when the trip is booked. *(Ability of Judgement; operational)* 

(23) Misuse of data. Measure: GDPR, Data management and control. (Personal safety; strategic)

(24) Misuse of technology. Measure: cost-benefit considerations of each single device/ software, defined application modalities, persons in charge, responsibilities, control (e.g., four-eye principle). (*Personal safety; strategic*)

(27) Perspective Victim: In emergency cases, the heart rate measures/ submission is sensitive, therefore there is a risk of triage in advance, possibly based on incorrect data. Measure: Reasons and added value of collecting the data/ wearing the smart bracelet must be present and communicated. Giving information for compliance using

an informed consent discussion and form; additionally assuring that the passenger understood the information. (*Personal Safety; operative and tactical*)<sup>16</sup>

(28) Perspective Responder: In emergency cases, the heart rate measures/ submission is sensitive, therefore there is a risk of triage in advance; possibly based on incorrect data. Measure: Reasons and added value of collecting the data/ wearing the smart bracelet must be present and communicated. Giving information for compliance using an informed consent discussion and form; additionally assuring that the passenger understood the information. (Ability of Judgement; operative and tactical)<sup>17</sup>

(33) Smart Glasses must be worn by seafarers in everyday life and in emergency cases. Measure: Maximize usability. *(Availability; strategic)* 

#### 4.9.4 Stage IV:

(25) In everyday life, the measurement, processing and storing of heart rates (health data) are very sensitive. Measure: Reasons and added value must be present and communicated. Situations and needs of measuring, processing and storing must be defined. Giving information for compliance using an informed consent discussion and form; additionally assuring that the passenger understood the information. (*Personal Safety; operative and strategic*)<sup>18</sup>

#### 4.9.5 Conclusion:

The use and services of several devices of the PALAEMON project changed since the 3<sup>rd</sup> EESSR-workshop. Especially the smart bracelet doesn't fulfil the initial task of monitoring the wearers but aims to be used for (1) displaying symbols (like arrows), showing the path to the next mustering station, (2) heart rate measurement and transmission as well as (3) containing an emergency button. The AR-glasses support communication and data collection but don't display real-time environment information and evacuation tactics anymore. Further, the PaMEAS-App was added to take over the function of real-time communication.

However, it is obvious that the aspect of data recording for a later analysis is of new interest. This is represented by the added Voyage Data Recorder and the new functions in regard of data collecting for analyses of the smart cameras and the AR-glasses.

These modifications of the technological system in the project lead directly to changes in the ethical views of the technologies: three of the ethical issues that were assumed from the 3<sup>rd</sup> workshop were completely deleted as they don't comply with the defined technology system at this status, 5 ethical issues needed to be amended and 9 ethical issues were added. Moreover, the workshop participants agreed on the need of new cost-benefit considerations of each single device/ software but also as parts of the system. With this, the use of the smart bracelet and especially its function of the heart rate transmission has been assessed as extremely sensitive. In detail, this is due to privacy issues of processed health data (GDPR),

<sup>&</sup>lt;sup>16</sup> See also (28) that displays this issue from the responders' perspective.

<sup>&</sup>lt;sup>17</sup> See also (27) that displays this issue from the victims' perspective.

<sup>&</sup>lt;sup>18</sup> With defined reasons (not available at this point of time) this ethical issue could be graded with Stage III.

the risk of malfunctions leading to wrong decisions, and the missing added value of collecting the data. This is the reason why the issue (25) concerning "Personal Safety" was ethically graded with Stage IV.

Apart from that, all ethical issues are valued with an ethical gravity of Stage I to III; most are located in the midfield of ethical gravity (Stage I: 3 ethical issues; Stage II: 13 ethical issues; Stage III: 10 ethical issues), meaning that the issues are sensitive and at the least require measures, but partly (10 out of 23 issues allocated to Stage II and III) also need to be monitored permanently.

All three issues graded with Stage I from an ethical viewpoint are allocated to the dimension "Ability of Judgement" and to the strategic level. The remaining ethical issues are categorized in diverse dimensions but the majority - 11 ethical issues – allocated to "Personal Safety". The other aspects are distributed over the dimensions of "Availability" (6), Ability of Judgement (3), "Participation" (2) and "Care and Support" (1).

In conclusion, most ethical issues concern the strategic layer (16), 6 ethical issues aim at the tactical layer and 9 the operative layer. This can be interpreted to mean that more than half of the identified ethical issues can be clarified early on, as it concerns long-term planning.

To sum it up briefly, it is recommended that several technologies and their functions as well as the system are evaluated once again and, as a consequence, – if the application is not reasonable by a cost-benefit consideration – amended or, as a last resort, dropped. This refers especially to the smart bracelets and the heart rate transmission, but also to the AR-glasses.

#### 5 Final ethical examination of the prototype

During the final examination of the prototype system of PALAEMON, severe restrictions to the platform have been experienced and not all functionalities were able to be tested.

As all critical elements of PALAEMON were related to these elements, an in-depth analysis of the final prototype was not possible.

With this, it was decided by JOAFG to focus on the accessibility of the final prototype of the PALAEMON user interface for passengers.

#### 5.1 PaMEAS-App

Generally, the system was well designed and aspects of high contrast and large icons have been considered preliminary by the development team. During the first tests in November 2022, it became clear that messages need to be adjusted to be clearer and understandable without any doubt. Instructions needed to be shortened and direct. Full sentences were not necessary to understand the messages. Also, some aspects of the design had to be reconsidered for a better understanding for people with limitations and disabilities.

Until December 2022 for the 2<sup>nd</sup> test, most of the issues have been solved and the PALAEMON prototype can be considered a user-friendly interface for passengers.

#### 5.2 MEV (Mass Evacuation Vessel)

The MEV concept was considered as critical for people with mobility limitations. Also, on the first draft of the design, interior elements like first aid arrangements, toilets and water supply were missing. The manoeuvrability for people with handicaps within the MEV was hardly possible. Also, for first responders and crew, it would be hard to support people in need of help.

A main problem was that there is no place for medical treatment. A CPR is hardly possible within the MEV: It was considered to provide a place within the MEV for medical treatment and support (enriched first aid measurements).

During a MEV simulation test at the premises of JOAFG, it was investigated what is the fastest way to board the MEV in two situations: 1. With healthy subjects 2. With one mobility restricted subject. It was a very clear result that the boarding time for the MEV was increased dramatically in scenario 2. Even with a carrying chair (multiple options were used), time was still much longer in comparison.

A suggestion for future Mustering actions would be to allow people with a mobility restriction to access the MEV already when arriving at the Muster station, before all others and without any delay. This keeps the mustering process unhindered for those without mobility restrictions and would not decrease the mustering time.

#### 6 Conclusion

The pilots have shown what kind of data would be possible to be collected from passengers and how they could be used. Also, the evacuation procedure and the built of a MEV showed where potential flaws are hidden. In general, the observations went from discussions of foreseen developments in the proposal towards findings in the procedures during evacuation. Especially with the sight on passengers with mobility restrictions, the ethical considerations and discussions on how to handle these passengers and still secure the safety of healthy subjects, showed the importance of a discourse like this.

Whereas the use of drones and localisation technologies provided very a very sophisticated base for ethic evaluation, the direct interaction and process of handling vulnerable target groups showed the general issues with the current developments in the maritime field of action for leisure activities. The authors recommend to have an indepth analysis of the impact of higher rates and probabilities of passengers with mobility limitations. With the "Prater Study" and the MEV Mock Up during the project runtime, this has proven to be an essential core for the planning of new evacuation procedures. As the evacuation drills and the current SOPs fit nicely for the situation of healthy passengers, the growing market for senior travellers increases the need for medical evacuation procedures (MEDEVAC).

PALAEMON provided a critical insight and experiments that underline this issue. Even as the development of technical solutions to speed up the evacuation process has shown great forthcomings, the relatively new situation of vulnerable travellers in the latest years will become a more pressing issue. In the field of Ambient Assisted Living, several technologies have been tested that fulfil needs of an ageing society. This could provide a source of inspiration for the building of new ships and face the new challenges of this financially potent target group.

Finally the authors want to thank the PALAEMON consortium for the fruitful discourse and expertise that was shared and the cooperation and trust that was experienced.

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#### 8 Annex

The following tables are taken directly from the workshops and are provided in original language (partly German). This allows native language anchor examples. For the presented results in the deliverable, the translation was done to English.

Table 6 Summary of the issues identified in the 3<sup>rd</sup> Workshop (partly in German)

No.	Ethischer Aspekt/- Fragestellung (30.04.2021 SaS, CG, AP, GA)	Dimensionen	Ebene	Stage	Maßnahmen	WP	Task
1	Seafarers might not be trained in using drones.	Urteilsvermögen	Strategisch	Stage I	adequate training		
2	For compliance in regard of wearing the wristband information is needed/ must be given to passengers but also to staff members and seafarers (all wearers).	Urteilsvermögen	Strategisch	Stage I	Giving information for compliance		
3	Verpflichtung bei Schiffsbetretung: Armband MUSS immer getragen werden - Tracking nur im Notfall, "Steuerbar" von der Brücke	Persönliche Sicherheit	Strategisch	Stage II	Bedarf des "Funktion- Anschaltens" muss definiert sein; Verpflichtung un Information bei Reisebuchung		
4	Bridge needs to be trained and know the technological system very well for handling it also in stressful situations.	Urteilsvermögen	Strategisch	Stage I	adequate training		
5	Impaired persons: measures for evacuations could be taken beforehand if they are tracked especially: e.g. the wristband gives additional information about the impairment.	Hilfe und Unterstützung	Taktisch	Stage I	Requirement: this additional information must not be visible for others (for example the wristband must not be in another colour)!> zusätzliche Angaben zur Einschränkung /Behinderung bei der Buchung		

6	Drones/ smart cameras/ wristbands might not be ready for use (e.g. low/ no battery/ defect).	Verfügbarkeit	Operativ	Stage II	adequate service and care; fehlendes Signal bzw. Fehlermeldung bei Nicht- Funktionieren (Standards wie bei Hausnotruf) an die Brücke	
7	For tactical purposes data generated by drones/ smart cameras/ wristbands might be sent to the captain and to the coastguard.	Beteiligung	Taktisch	Stage II	The ethical issues of data protection, data storage, data analysis and further data usage must be kept in mind. Aufklärung zu Datenmanagement an alle Personen an Bord	
8	Operating drones poses a risk of injury (e.g. when crashing).	Persönliche Sicherheit	Operativ	Stage II	AusreichendTestung/Erprobung,Sensorik.Anforderung:DrohneaußerhalbdesbzwaußerhalbdesDunstkreisesfliegen.	
9	Operating drones poses a risk of injury (e.g. when crashing).	Persönliche Sicherheit	Strategisch	Stage II	AusreichendTestung/Erprobung,Sensorik.Anforderung:DrohneaußerhalbdesbzwaußerhalbdesDunstkreisesvonMenschenfliegen.	
10	Ground drones might hinder the evacuation.	Persönliche Sicherheit	Operativ	Stage II	nicht (mehr) im Projekt vorgesehen	

11	The use of two drones at the same time could produce a mutual obstruction.	Persönliche Sicherheit	Taktisch	Stage II	teil-automatisiert/ voll- automatisiert sollte das technosch kein Problem mehr sein	
12	If drones are navigated fully automatically via auto pilot, the drones can't perform individual, maybe for this evacuation case needed, flights and sights.	Urteilsvermögen	Taktisch	Stage II	Drohnen können manuell gesteuert werden und müssen dem Einsatzbedarf nachkommen - bereits als Anforderung im ZB1 definiert	
13	Fully automated smart cameras doesn't allow individual sights.	Urteilsvermögen	Taktisch	Stage II	Anforderung an die Technik: Stuerbarkeit/ Eingreifen durch User ermöglichen	
14	<u>All</u> persons on board (also staff members and seafarers) should wear wristbands.	Selbstverständnis des Nutzers	Strategisch	Stage II	erledigt im ProjektverlauF> alle tragen wristband	
15	Blind trust in technology bears an ethical issue: e.g. in an evacuation situation only wearers of wristbands could be evacuated, others not seen and following not cared for.	Hilfe und Unterstützung	Taktisch	Stage II	s.o. Verpflichtung Wrsitbands zu tragen bei Buchung> pos. Aspekt: effektive Ressourceneinteilung: außergewöhnliche Events (z.B. Massenaufläufe) können schneller/ leichter geortet werden	
16	A previous rescue of illegal and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation;	Hilfe und Unterstützung	Operativ	Stage II	ausgabe von Equipment und Information an die Aufgenommen	

17	A previous rescue of illegal and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation;	Verfügbarkeit	Strategisch	Stage III	entsprechende Vorbereitung für alle Gegebenheiten	
18	A previous rescue of illegal and refugees at sea: no equal treatment by the legislator and operating bodies.	Persönliche Sicherheit	Strategisch	Stage III	Gesetzgebung: Umsetzung von Gesetzen fraglich	
19	The application of drones are weather- dependent; no storm or strong precipitation as preconditions.	Verfügbarkeit	Strategisch	Stage II	Definition, wann welche Drohne eingesetzt werden kann und wann nicht> andere Vorgehensweise ohne Drohne (Drohnen-Info nicht als Entscheidungsgrundlage)	
20	The application of drones are weather- dependent; no storm or strong precipitation as preconditions.	Urteilsvermögen	Taktisch	Stage III	andere Vorgehensweise ohne Drohne (Drohenen-Info nicht als Entscheidungsgrundlage)	
21	By the application of drones/ smart cameras/ wristbands victims and also responders have no possibility of self- determination in regard of their observation.	Persönliche Sicherheit	Operativ	Stage III	GDPR, Data management; unterschiedliche Modi Evakuierung-/Normalfall	
22	By the application of sensor wristbands victims and responders (seafarers) have no possibility of self-determination in regard of their observation besides putting it down and therefore have a higher risk to get lost.	Persönliche Sicherheit	Operativ	Stage III	2 Modi: Tracking nur im definierten Notfall; Trage- Verpflichtung bei Buchung (s.o.)	

23	Datenmissbrauch	Persönliche Sicherheit	Strategisch	Stage III	GDPR, Data management;
24	Technologiemissbrauch	Persönliche Sicherheit	Strategisch	Stage III	definierte Einsatz-Modalitäten und Zuständigkieten/ Verantwortungen/ Kontrolle (4- Augen Prinzip)
	Zusätzlicher Aspekt: Passengers get disturbed/are in constant irritation because of the technologies used to guarantee their safety, while trying to be on vacation for which they paid. Development of a constant feeling of surveillance vs relaxing holidays.				Keine ständigen (akustischen) Signale von den Einzeltechnologien, wie Armbändern etc resp. angenehme Gestaltung, die eine Gewöhnung ermöglicht. Onboarding für System und Aufklärung über sämtliche Geräuschkulissen und technologiebezogenen Abläufe.

Table 7 Summary of the issues identified in the 4th Workshop (partly in German)

No	Ethischer Aspekt/- Fragestellung (30.04.2021 SaS, CG, AP, GA)	Maßnahmen	Dimensionen	Ebene	Spalte1	Stag e	WP	Task
1	Seafarers might not be trained in using drones.	adequate training + certifiction (legt auch die Verantwortlichen fest)	Urteilsvermöge n	Strategisc h		Stag e I		
2	For compliance in regard of wearing the wristband information is needed/ must be given to passengers but also to staff members and seafarers (all wearers).	Giving information for compliance - Informed Consent (Information, Aufklärungsgespräch und Sichergehen, dass der Träger verstanden hat)	Urteilsvermöge n	Strategisc h		Stag e I		
25	Bracelet: Heartrate-Messung/- sammlung ist Datenschutzrechtlich (Gesundheitsdaten) extrem heikel. Im Alltag	Begründung und Mehrwert muss gegeben und kommuniziert sein; Def wann die Daten übermittelt/ bearbeitet/ gespeichert werden. Giving information for compliance - Informed Consent (Information, Aufklärungsgespräch und Sichergehen, dass der Träger verstanden hat)	Persönliche Sicherheit	Strategisc h	Operativ	Stag e IV	Begründu ausständi Begründu 3	ing dzt g; mit ing: Stufe

26	Im Alltag und im Notfall: Interepretation (individueller Grenzwerte und in verschiedenen Situationen) der Heartrate notwendig: hohe Heartrate (auch für dieses Individuum) heißt nicht immer "Not"> fraglich	Rückfragemglkt ob sich Träger in Not befindet/Hilfe benötigt muss gegeben sein	Persönliche Sicherheit	Operativ	Strategisc h	Stag e II	
27	Im Notfall: Bracelet: Heartrate- Messung/- übermittlung extrem heikel: Gefahr der Triage vorab v.a. auch auf Grund möglicher falscher Daten - Perspektive Victim	Begründung und Mehrwert muss gegeben und kommuniziert sein; Giving information for compliance - Informed Consent (Information, Aufklärungsgespräch und Sichergehen, dass der Träger verstanden hat);	Persönliche Sicherheit	Taktisch	Operativ	Stag e III	
28	Im Notfall: Bracelet: Heartrate- Messung/- übermittlung extrem heikel: Gefahr der Triage vorab v.a. auch auf Grund möglicher falscher Daten - Perspektive Responder	Begründung und Mehrwert muss gegeben und kommuniziert sein; Giving information for compliance - Informed Consent (Information, Aufklärungsgespräch und Sichergehen, dass der Träger verstanden hat);	Urteilsvermöge n	Taktisch	Operativ	Stag e III	

29	Zwang das Armband zu tragen. Ansosnten darf der Passagier nicht mitfahren	Begründung und Mehrwert muss gegeben und kommuniziert sein; Giving information for compliance - Informed Consent (Information, Aufklärungsgespräch und Sichergehen, dass der Träger verstanden hat);	Beteiligung	Strategisc h		Stag e II	
30	Armband könnte Fehlfunktion aufweisen	Statusmeldung via PaMEAS - regelmäßige Überprüfung	Verfügbarkeit	Strategisc h	Operativ	Stag e II	
31	Beim Armband wird die Batterie leer - zum Aufladen muss die Uhr abgelegt werden> Nachteil durch Nicht-Tragen entsteht	Ladehäufigkeit minimieren; Unterstützung seitens Crew anbieten	Verfügbarkeit	Operativ	Strategisc h	Stag e II	
32	Smart Glasses: Datenaufzeichnung bereits VOR der Evakuierung> Datenaufzeichnung kritisch weil es die eigene Privatsphäre der Passagiere einschränkt (auch weil beweglich und nicht fix wie die Smart Cameras)	Giving information for compliance - Informed Consent (Information, Aufklärungsgespräch und Sichergehen, dass der Träger und Passagiere verstanden hat)	Persönliche Sicherheit	Strategisc h		Stag e II	
33	Smart Glasses:Dauertragen im Alltag und im Notfall notwendig. Praktikabilität fraglich	Usablity durchdenken/ maximieren	Verfügbarkeit	Strategisc h		Stag e III	

3	Verpflichtung bei Schiffsbetretung: Armband MUSS immer getragen werden - <b>Tracking</b> nur im Notfall, "Steuerbar" von der Brücke	Bedarf des "Funktion- Anschaltens" muss definiert sein; Verpflichtung un Information bei Reisebuchung	Persönliche Sicherheit	Strategisc h	Stag e II	
4	Bridge needs to be trained and know the technological system very well for handling it also in stressful situations.	adequate training + certifiction (legt auch die Verantwortlichen fest)	Urteilsvermöge n	Strategisc h	Stag e I	
5	Impaired persons: measures for evacuations could be taken beforehand if they are <b>tracked</b> especially: e.g., the wristband gives additional information about the impairment.	Requirement: this additional information must not be visible for others (for example the wristband must not be in another colour)!> zusätzliche Angaben zur Einschränkung /Behinderung bei der Buchung	Hilfe und Unterstützung	Taktisch	Stag e I	
6	sh. oben Drones/ smart cameras/ wristbands might not be ready for use (e.g., low/ no battery/ defect).	adequate service and care; fehlendes Signal bzw. Fehlermeldung bei Nicht-Funktionieren (Standards wie bei Hausnotruf) an die Brücke	Verfügbarkeit	Operativ	Stag e II	
7	For tactical purposes data generated by drones/ smart cameras/ wristbands might be sent	The ethical issues of data protection, data storage, data analysis	Beteiligung	Taktisch	Stag e II	

	to the captain and to the coastguard.	and further data usage must be kept in mind. Aufklärung zu Datenmanagement an alle Personen an Bord					
8	Operating drones poses a risk of injury (e.g., when crashing).	Ausreichend Testung/ Erprobung, Sensorik. Anforderung: Drohne muss außerhalb des Schiffsbereichs bzw außerhalb des Dunstkreises von Menschen fliegen.	Persönliche Sicherheit	Operativ	Strategisc h	Stag e II	
11	The use of two drones at the same time could produce a mutual obstruction.	teil-automatisiert/ voll- automatisiert sollte das technosch kein Problem mehr sein	Persönliche Sicherheit	Taktisch		Stag e II	
13	Fully automated smart cameras doesn't allow individual sights.	Anforderung an die Technik: Stuerbarkeit/ Eingreifen durch User ermöglichen; Missbrauch verhindern	Urteilsvermöge n	Taktisch		Stag e II	
16	A previous rescue of illegal and refugees at sea and therefore their attendance on the ship might affect the process of the evacuation;	ausgabe von Equipment und Information an die Aufgenommen	Hilfe und Unterstützung	Operativ		Stag e II	
17	A previous rescue of illegal and refugees at sea and therefore their	entsprechende Vorbereitung für alle Gegebenheiten	Verfügbarkeit	Strategisc h		Stag e III	

	attendance on the ship might affect the process of the evacuation;					
18	A previous rescue of illegal and refugees at sea: no equal treatment by the legislator and operating bodies.	Gesetzgebung: Umsetzung von Gestzen fraglich	Persönliche Sicherheit	Strategisc h	Stag e III	
19	The application of drones are weather-dependent; no storm or strong precipitation as preconditions.	Definition, wann welche Drohne eingestezt werden kann und wann nicht> andere Vorgehensweise ohne Drohne (Drohenen-Info nicht als Entscheidungsgrundlag e)	Verfügbarkeit	Strategisc h	Stag e II	
20	The application of drones are weather-dependent; no storm or strong precipitation as preconditions.	andere Vorgehensweise ohne Drohne (Drohenen-Info nicht als Entscheidungsgrundlag e)	Urteilsvermöge n	Taktisch	Stag e III	
21	By the application of drones/ smart cameras/ wristbands/ AR glasses/ PaMEAS App victims and also responders have no possibility of self-determination in regard of their observation.	GDPR, Data management; unterschiedliche Modi Evakuierung- /Normalfall; application of each single device/ software must be	Persönliche Sicherheit	Operativ	Stag e III	

		questioned - coste- benefit factor				
22	By the application of sensor wristbands victims and responders (seafarers) have no possibility of self-determination in regard of their observation besides putting it down and therefore have a higher risk to get lost.	2 Modi: Tracking nur im definierten Notfällen ; Trage-Verpflichtung bei Buchung (s.o.)	Persönliche Sicherheit	Operativ	Stag e III	
23	Datenmissbrauch	GDPR, Data management;	Persönliche Sicherheit	Strategisc h	Stag e III	
24	Technologiemissbrauch	cost-benefit factor; definierte Einsatz- Modalitäten und Zuständigkieten/ Verantwortungen/ Kontrolle (4-Augen Prinzip)	Persönliche Sicherheit	Strategisc h	Stag e III	
	Zusätzlicher Aspekt: Passengers get disturbed/are in constant irritation because of the technologies used to guarantee their safety, while trying to be on vacation for which they paid. Development of a constant feeling of surveillance vs relaxing holidays.	Keine ständigen (akustischen) Signale von den Einzeltechnologien, wie Armbändern etc resp. angenehme Gestaltung, die eine Gewöhnung ermöglicht. Onboarding für System und Aufklärung über sämtliche Geräuschkulissen und				

	technologiebezogenen Abläufe.			