

2025 MAKERS CHALLENGE

“HSE in Industry 5.0”

INTRODUCTION

Imagine a future where people and robots work side by side—not just to speed things up, but to create workplaces that are safer, smarter, and more sustainable. That’s the vision of **Industry 5.0**: a world where technology and humans collaborate, the environment is respected, and worker well-being comes first.

This challenge invites you to develop innovative solutions that improve **Health, Safety, and Environmental (HSE)** practices in this evolving industrial landscape. In Industry 5.0, HSE is more than rules—it’s smart, human-centered, and sustainability-driven. It’s about using technology to build greener, safer, and healthier workspaces where both people and machines can thrive.

As a Maker team, your mission is to **tackle real-world challenges** faced by industries in Africa. Use your creativity and problem-solving skills to design bold solutions in one or more of these **focus areas**:

- Worker Safety
- Environmental Sustainability
- Human-Machine Collaboration Safety

Let your ideas shape the future of work—one where industries succeed while protecting people and the planet!

THE CHALLENGE

Makers teams are challenged to design and develop a novel solution that significantly improves Health, Safety, or Environmental (HSE) practices within an Industry 5.0 context. This means your solution should consider the interaction between humans and technology (e.g., robotics, automation, AI) in an industrial setting. Teams can choose or combine any of the following focus areas.

- **Worker Safety:**

- Develop a wearable device, sensor system, or smart tool that proactively prevents workplace accidents or injuries. Consider scenarios like: Working at heights ; Operating heavy machinery ; Handling hazardous materials ; Working in confined spaces ; Exposure to extreme temperatures or noise ; Ergonomic risks (repetitive strain, lifting) ; Human-robot collaboration safety.
- Create a training simulation or augmented reality (AR) application that enhances worker safety training and awareness.
- Design a system that improves communication and emergency response in industrial environments.

THE CHALLENGE

- **Environmental Sustainability:**

- Develop a system for real-time monitoring and reduction of industrial emissions (air, water, noise).
- Create a solution for efficient waste management and recycling within a factory or industrial site.
- Design a process or technology that minimizes energy consumption in industrial operations.
- Develop a sustainable alternative to a currently used hazardous material or process.
- Create a system for monitoring and mitigating the environmental impact of resource extraction (e.g., in mining).

- **Human-Machine Collaboration Safety:**

- Address a specific safety challenge arising from the interaction of humans and robots in a manufacturing or industrial setting. This could involve:
 - Improved sensor systems to prevent collisions.
 - Intuitive interfaces for human control and oversight of robotic systems.
 - Predictive systems to anticipate and avoid potential hazards.
 - Safeguards for collaborative robots (cobots).

Competition Deliverables

Each team must offer the following deliverables for judging (in French or English):

1. Portfolio summarizing the team's design approach: Design Thinking or Whole System & Life Cycle Thinking
2. Design and build a functional model of solution
3. Create a poster explanation of solution
4. Deliver a 5-7 min presentation

The following documentation explains the expectations for each deliverable.

PORTFOLIO

Teams must select a design approach to develop their solution and document their process and results in a summary portfolio. The portfolio is suggested to be ~ 10 pages and will be evaluated based on the quality, depth, and clarity of its content,

Design Thinking Option

Use the human-centered Design Thinking process (Empathize, Define, Ideate, Prototype, Test/Feedback) to develop a new product or service that improve HSE practices in the industry context.

Empathize	Define	Ideate	Table-top Model	Test/Feedback
<p>Prompt: Learn about the audience whom you are designing.</p> <p>The teams explain their research technique (interviews, experiencing, observing) to identify and define the emotions and concerns of the primary stakeholder(s). Team displays a deep understanding of the various viewpoints of the primary stakeholder(s).</p>	<p>Prompt: Construct a point of view that is based on user needs & insights.</p> <p>The team has analyzed the information gathered in the Empathy phase to create a problem statement that defines the target user and their true need.</p>	<p>Prompt: Brainstorm and come up with creative solutions.</p> <p>The team has generated a high volume of ideas comparing and grouping possible solutions, many of which include innovative and non-traditional ideas. The final design solution is well justified and highly likely viable.</p>	<p>Prompt: Build a representation of one or more of your ideas to show to others.</p> <p>The table-top model is clearly and fully explained, with enough detail to assure that nearly/all design requirements are addressed. The model shows great display of imagination, creativity, and workmanship.</p>	<p>Prompt: Return to your original user group to test your ideas for feedback.</p> <p>The team has developed a testing plan that addresses nearly/all of the design requirements. The team has provided a logical, well-developed explanation regarding the potential effectiveness of the design.</p>

Whole Systems & Life Cycle Thinking Option

Use this sustainable design approach to redesign or improve an existing product, service, or system to enhance its HSE performance. Consider the entire life cycle, from resource extraction to disposal.

Problem Definition	Life Cycle Priorities Consideration	Whole System Solution Consideration	Reflect on Redesigned Solution	Table-top Model
<p>Prompt: Define a problem by looking at the Whole System and draw a map or describe in words the Whole System that the product or service fits into.</p> <p>The team must create a comprehensive map or description (including aspects beyond the product/service itself) and breaking things into subsystems where relevant. The map/description must clearly show the flow of the process from one step to another depicting how user interacts with the product or service.</p>	<p>Prompt: Prioritize areas of redesign by considering the Life Cycle impact of the current design.</p> <p>The team must consider the stages involved in the life of the product or service such as material extraction, manufacture, transport, use and disposal.</p> <p>Teams must indicate the biggest opportunities and improvements.</p>	<p>Prompt: Generate creative alternatives for the product, given the established priorities.</p> <p>The teams must consider the whole system of the product/service and generate a high volume of ideas for solutions including solutions for identified opportunities and top priorities.</p>	<p>Prompt: Reflect on the impacts of the redesigned product/service including projected job creation.</p> <p>The team must choose a good set of design solutions to compare and select the best design, providing a clear description of it. Teams should reflect on the redesign including threats and opportunities, projected job creation and impacts (such as social, cultural, political, economic, ecologic impact).</p>	<p>Prompt: Build a table-top model of one or more of your ideas to show others.</p> <p>The team must clearly and fully describe a table-top model, with enough detail to assure that the problem identified in the problem definition phase has been addressed. The model should show great display of imagination, creativity, aesthetics and workmanship.</p>

MODEL OF INNOVATION

Makers teams are tasked to create a model that describes their innovation. The model should effectively demonstrate a core aspect or functionality of the proposed innovation. This demonstration can take various forms of functional prototyping, mock-ups, software demos, and preliminary analysis, tailored to the solution. The model should show a great display of imagination, creativity, aesthetics and workmanship.

Important Considerations:

- Model material cannot cost more than \$200 USD. Teams must provide a material expense list. Teams must estimate the value of any scrap and donated materials used to ensure it does not exceed the \$200 limit. Team loses 1 point from their score for every dollar over \$200.
- Teams must bring their model to the competition; therefore, make plans on how to transport your model on plane/car to PARC.

CREATE A POSTER

Makers teams will have the opportunity to show off their hard work and creativity by developing a poster. It is recommended to use a tri-fold poster but teams can use a standard poster board. Content of the poster can include information on:

- Team members
- Home country and/or city
- Solution Proposal
 - The HSE Industry 5.0 context that solution addresses
 - Proposed innovation / solution (can use diagrams, sketches, photos of model)
 - Key features and functionality
 - Design Thinking/WS+LC highlights
 - Expected impact and benefits
- Problems faced during the development of model
- Other items that the team wants to share

PRESENTATION

Makers teams must deliver a 5-7 minutes presentation during PARC in Senegal about their project. All team members are encouraged to have a speaking part during the presentation.

Team members can use items such as their model or poster during the presentation. This is the team's moment to shine in front of hundreds of spectators and supporters... be creative and make the presentation exciting!

JUDGING

Teams will be judged on each of the following deliverables:

- Portfolio of Design (content, aesthetic/organization)
- Solution Model (idea, imagination, creativity, aesthetics, workmanship, within budget)
- Poster (content, aesthetic/organization)
- Presentation (content, clarity, team work)

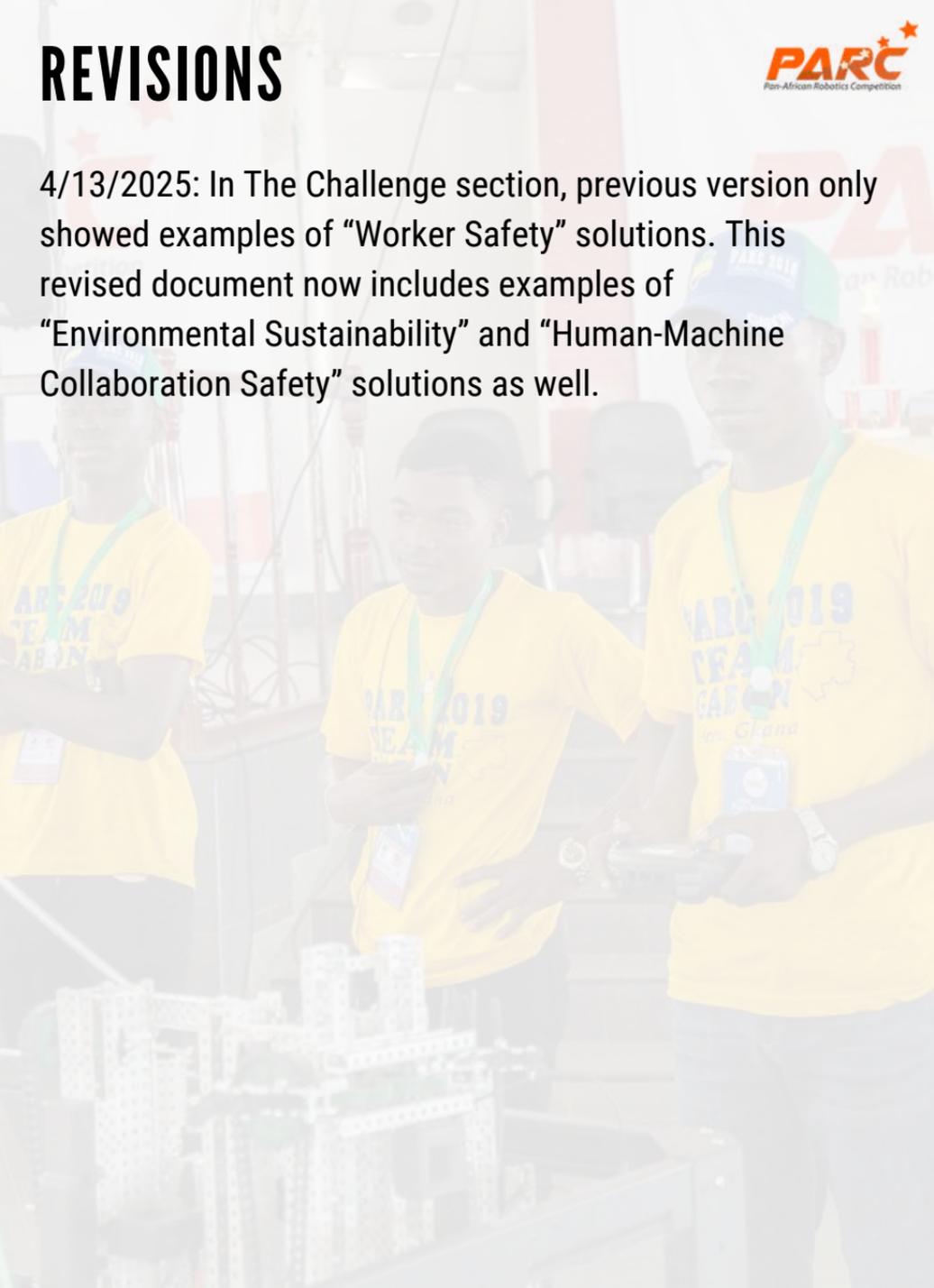
Each deliverable will receive a score of (10)- Exemplary, (8)- Competent, (6)- Developing, (4)- Marginal or (2)-Needs Major Support.

Judging Rubric	
Score	Description
10 Exemplary	Strong evidence of meeting or exceeding the objectives Strong evidence of meeting or exceeding expected effort. Response is compelling and specific, responding effectively to all parts of the prompt. Response is enriched by critical thinking, creativity, and insight.
8 Competent	Evidence suggests adequate meeting of objectives. Response is detailed and specific, responding to all parts of the prompt. Shows critical thinking, and/or creativity. Evidence suggests appropriate effort has been applied to this task.
6 Developing	Evidence suggests some objectives are met. Responds to all parts of the prompt but response lacks 1-2 important details. Shows some critical thinking and/or creativity. Evidence suggests some effort has been applied, but greater effort would have improved the response.
4 Marginal	Evidence suggests some partially met objectives. Responds to only part of the prompt. Response lacks detail. Minimal evidence of critical thinking and/or creativity. Evidence suggests minimal effort has been applied to this task.
2 Needs Major Support	Evidence suggests failure to meet desired objectives. Response is off topic or largely incomplete. No critical thinking or creativity evident. Evidence suggests no serious effort has been applied to this task.

Penalties: Teams will receive a 1 point deduction for every day that the portfolio is late and a 1 point deduction for every dollar over the \$200 budget limit.

REVISIONS

4/13/2025: In The Challenge section, previous version only showed examples of “Worker Safety” solutions. This revised document now includes examples of “Environmental Sustainability” and “Human-Machine Collaboration Safety” solutions as well.



DÉFI DES MAKERS 2025

“HSE dans l’Industrie 5.0”

INTRODUCTION

Imaginez un avenir où les humains et les robots travaillent côte à côte, non seulement pour accélérer les choses, mais pour créer des lieux de travail plus sûrs, plus intelligents et plus durables. C'est la vision de **l'Industrie 5.0** : un monde où la technologie et les humains collaborent, où l'environnement est respecté et où le bien-être des travailleurs passe en priorité.

Ce défi vous invite à développer des solutions innovantes qui améliorent les pratiques en matière de **Santé, Sécurité et Environnement (SSE)** dans ce paysage industriel en évolution. Dans l'Industrie 5.0, la SSE est bien plus que des règles – elle est intelligente, centrée sur l'humain et axée sur la durabilité. Il s'agit d'utiliser la technologie pour construire des espaces de travail plus verts, plus sûrs et plus sains, où les personnes et les machines peuvent prospérer.

En tant qu'équipe de créateurs, votre mission est **de relever les défis réels** auxquels sont confrontées les industries en Afrique. Utilisez votre créativité et vos compétences en résolution de problèmes pour concevoir des solutions audacieuses dans l'un ou plusieurs de ces **domaines** :

- Sécurité des travailleurs
- Durabilité environnementale
- Sécurité de la collaboration homme - machine

Laissez vos idées façonner l'avenir du travail—un avenir où les industries réussissent tout en protégeant les personnes et la planète!

LE DEFI

Les équipes de “Makers”(créatives) sont mises au défi de concevoir et développer une solution innovante qui améliore de manière significative les pratiques en matière de Santé, Sécurité ou Environnement (SSE) dans le contexte de l'Industrie 5.0. Cela signifie que votre solution doit prendre en compte l'interaction entre les humains et la technologie (par exemple : robotique, automatisation, intelligence artificielle) dans un environnement industriel. Les équipes peuvent choisir ou combiner l'un des axes suivants :

Sécurité des travailleurs :

- Développez un dispositif portable, un système de capteurs ou un outil intelligent capable de prévenir de manière proactive les accidents ou blessures sur le lieu de travail. Pensez à des scénarios comme : Travail en hauteur; Conduite ou utilisation de machines lourdes; Manipulation de matériaux dangereux; Travail en espaces confinés; Exposition à des températures extrêmes ou à un niveau sonore élevé; Risques ergonomiques (troubles musculosquelettiques, port de charges répétitif); Sécurité dans la collaboration homme-robot
- Créez une simulation de formation ou une application en réalité augmentée (AR) pour améliorer la formation et la sensibilisation à la sécurité des travailleurs.
- Concevez un système qui améliore la communication et la réponse d'urgence dans les environnements industriels.

LE DEFI

- **Durabilité environnementale :**
 - Développer un système de surveillance et de réduction en temps réel des émissions industrielles (air, eau, bruit).
 - Créer une solution efficace de gestion et de recyclage des déchets au sein d'une usine ou d'un site industriel.
 - Concevoir un procédé ou une technologie minimisant la consommation d'énergie des opérations industrielles.
 - Développer une alternative durable à une matière ou un procédé dangereux actuellement utilisé.
 - Créer un système de surveillance et d'atténuation de l'impact environnemental de l'extraction des ressources (par exemple, dans l'exploitation minière).
- **Sécurité de la collaboration homme-machine :**
 - Répondre à un défi de sécurité spécifique lié à l'interaction entre humains et robots dans un environnement industriel ou de fabrication. Cela pourrait impliquer :
 - des systèmes de capteurs améliorés pour prévenir les collisions.
 - des interfaces intuitives pour le contrôle et la surveillance humains des systèmes robotiques.
 - des systèmes prédictifs pour anticiper et éviter les dangers potentiels.
 - des mesures de protection pour les robots collaboratifs (cobots).

Livrables de la compétition

Chaque équipe doit soumettre les livrables suivants à l'évaluation (en français ou en anglais) :

- Portfolio résumant l'approche de conception de l'équipe : Design Thinking ou Whole System & Life Cycle Thinking
- Concevoir et construire un modèle fonctionnel de solution
- Créer une affiche explicative de la solution
- Faire une présentation de 5 à 7 minutes

La documentation suivante explique les attentes pour chaque livrable.

PORTFOLIO

Les équipes doivent choisir une approche de conception pour développer leur solution et documenter leur processus ainsi que leurs résultats dans un portfolio de synthèse. Ce portfolio, dont la longueur suggérée est d'environ 10 pages, sera évalué en fonction de la qualité, de la profondeur et de la clarté de son contenu.

Option de réflexion conceptuelle

Utilisez le processus de conception centrée sur l'humain (empathie, définition, idéation, prototypage, test/retour d'information) pour développer un nouveau produit ou service qui améliore les pratiques HSE dans le contexte industriel.

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Option de réflexion sur les systèmes globaux et le cycle de vie

Utilisez cette approche de conception durable pour repenser ou améliorer un produit, un service ou un système existant afin d'en renforcer la performance en matière de santé, sécurité et environnement (SSE). Prenez en compte l'ensemble du cycle de vie, de l'extraction des ressources jusqu'à l'élimination.

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MODÈLE D'INNOVATION

Les équipes de makers doivent créer une maquette décrivant leur innovation. Cette maquette doit démontrer efficacement un aspect ou une fonctionnalité essentielle de l'innovation proposée. Cette démonstration peut prendre diverses formes : prototypage fonctionnel, maquettes, démonstrations logicielles et analyse préliminaire, adaptées à la solution. La maquette doit faire preuve d'imagination, de créativité, d'esthétique et de savoir-faire.

Points importants :

Le coût des matériaux de la maquette ne peut pas dépasser 200 \$ USD. Les équipes doivent fournir une liste des dépenses en matériaux. Elles doivent estimer la valeur des chutes et des dons de matériaux utilisés afin de garantir qu'elle ne dépasse pas 200 \$. L'équipe perd 1 point de son score pour chaque dollar au-delà de 200 \$.

Les équipes doivent apporter leur maquette à la compétition ; il est donc important de prévoir le transport de votre maquette par avion ou en voiture jusqu'au PARC.

CRÉER UNE AFFICHE

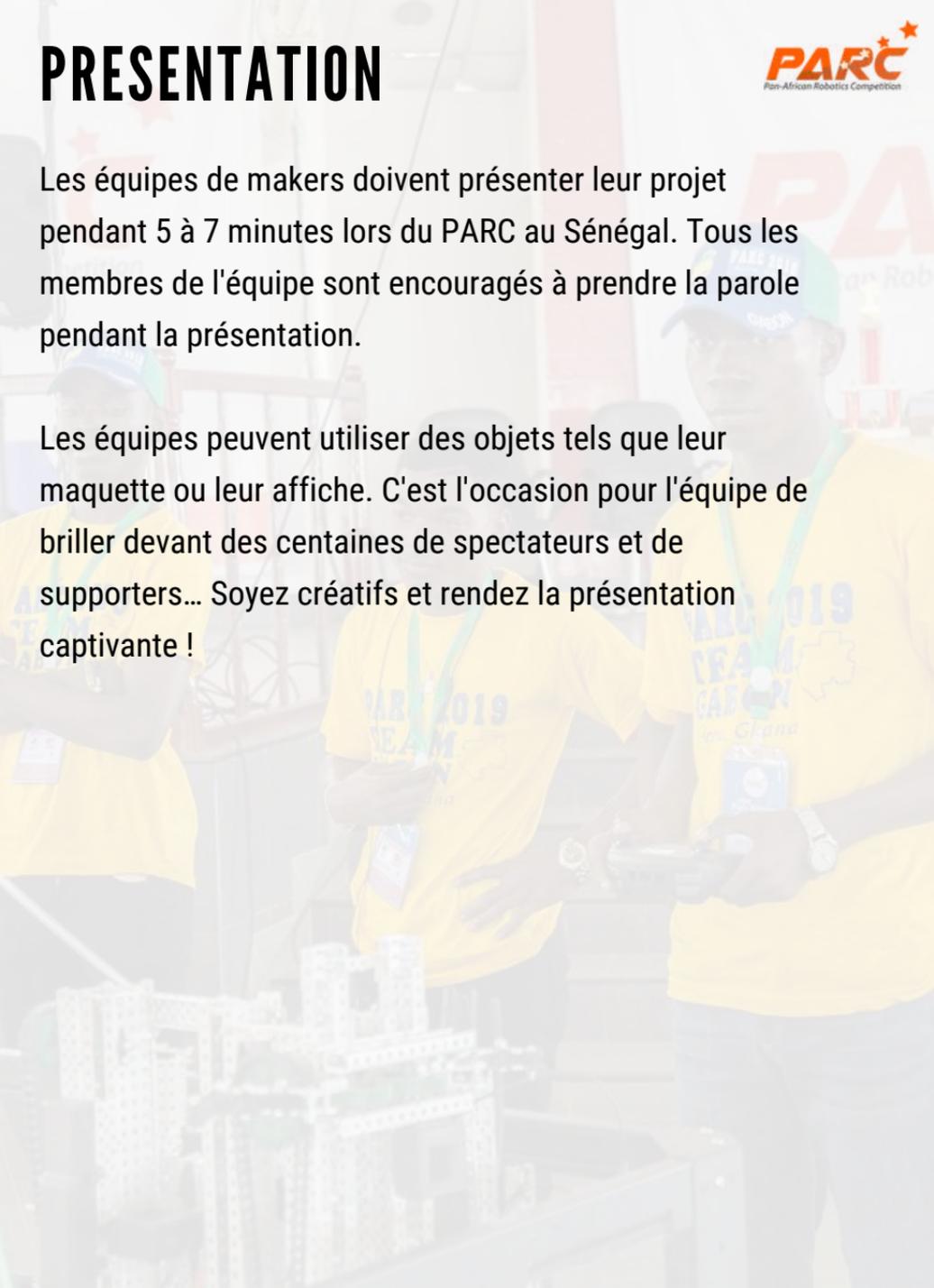
Les équipes de créateurs auront l'occasion de mettre en valeur leur travail acharné et leur créativité en créant une affiche. Il est recommandé d'utiliser une affiche à trois volets, mais les équipes peuvent utiliser un panneau d'affichage standard. Le contenu de l'affiche peut inclure des informations sur :

- Les membres de l'équipe
- Le pays et/ou la ville d'origine
- La proposition de solution
- Le contexte HSE Industrie 5.0 auquel la solution répond
 - L'innovation/solution proposée (schémas, croquis, photos du modèle peuvent être utilisés)
 - Les principales caractéristiques et fonctionnalités
 - Les points forts du Design Thinking/WS+LC
 - L'impact et les bénéfices attendus
- Les problèmes rencontrés lors du développement du modèle
- Les autres éléments que l'équipe souhaite partager

PRESENTATION

Les équipes de makers doivent présenter leur projet pendant 5 à 7 minutes lors du PARC au Sénégal. Tous les membres de l'équipe sont encouragés à prendre la parole pendant la présentation.

Les équipes peuvent utiliser des objets tels que leur maquette ou leur affiche. C'est l'occasion pour l'équipe de briller devant des centaines de spectateurs et de supporters... Soyez créatifs et rendez la présentation captivante !



Les équipes seront évaluées sur chacun des livrables suivants :

- Portfolio de conception (contenu, esthétique/organisation)
- Modèle de solution (idée, imagination, créativité, esthétique, qualité de fabrication, respect du budget)
- Affiche (contenu, esthétique/organisation)
- Présentation (contenu, clarté, travail d'équipe)

Chaque livrable recevra une note de :

- (10) - Exemplaire
- (8) - Compétent
- (6) - En développement
- (4) - Marginal
- (2) - Nécessite un soutien majeur

Judging Rubric	
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Pénalités : Les équipes recevront une déduction d'un point pour chaque jour de retard du portfolio et une déduction d'un point pour chaque dollar dépassant la limite budgétaire de 200 \$.

RÉVISIONS

13/04/2025 : Dans la section « Défi », la version précédente ne présentait que des exemples de solutions pour la « Sécurité des travailleurs ». Ce document révisé inclut désormais également des exemples de solutions pour la « Durabilité environnementale » et la « Sécurité de la collaboration homme-machine ».

