AZA4ICE

A JOURNEY INTO CIRCULAR AQUACULTURE

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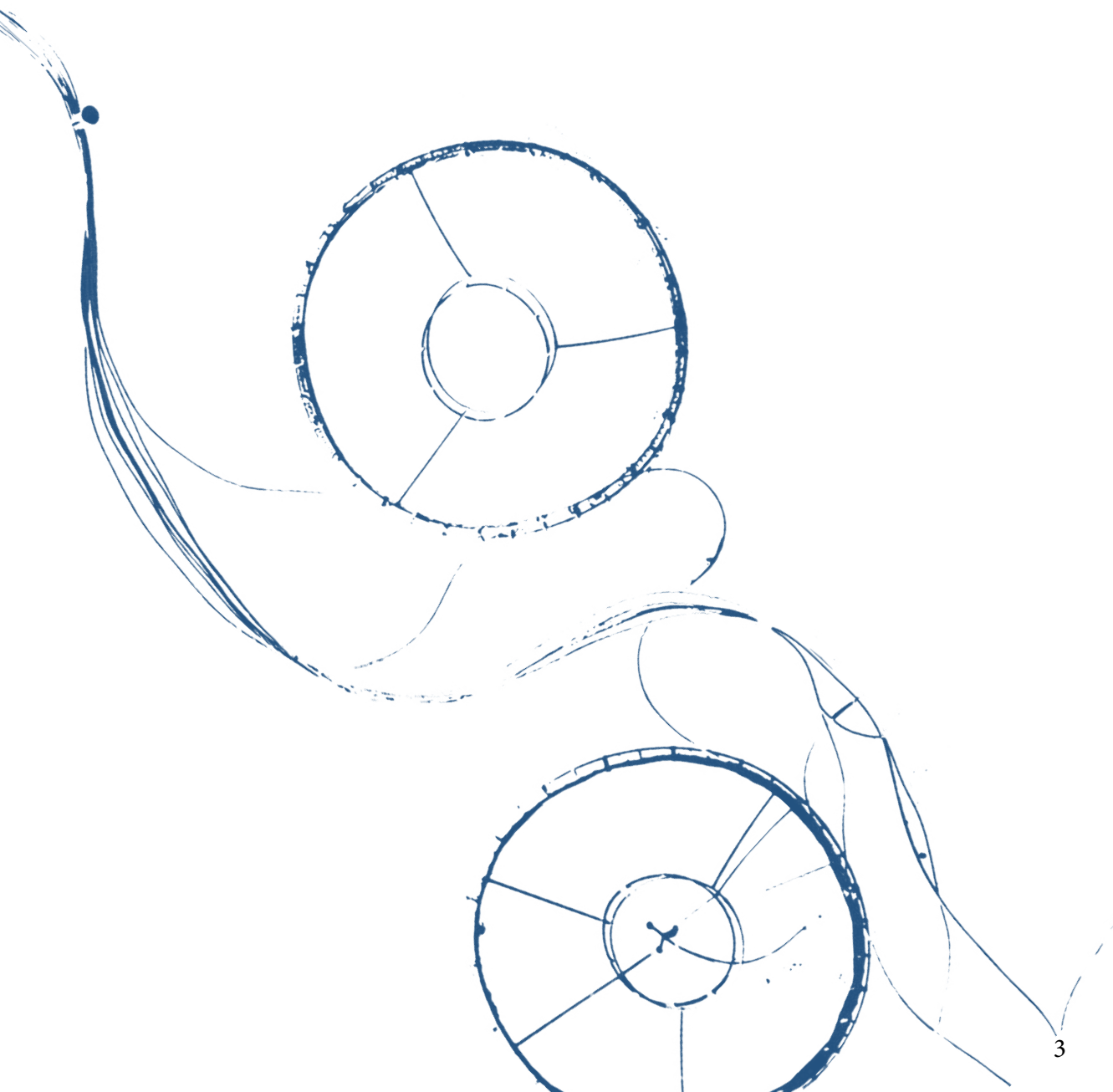

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AZA4ICE

FOREWORD

It is hard to imagine Mediterranean life — and our daily diets — without fish and seafood. For millennia, fisheries and aquaculture have provided livelihoods and shaped the Mediterranean diet. But today, most fisheries are exploited at or beyond sustainable limits, while climate change and pollution threaten the future of our seas.

This makes aquaculture one of the fastest-growing sources of aquatic food worldwide — and a key contributor to ensuring food security and sustainability. Yet, the sector faces major challenges: lack of sustainable development strategies, outdated linear economy practices, complex legal and licensing frameworks, limited public sector capacity, and restricted access to space. These barriers slow innovation and create conflicts over the use of coastal and inland waters.

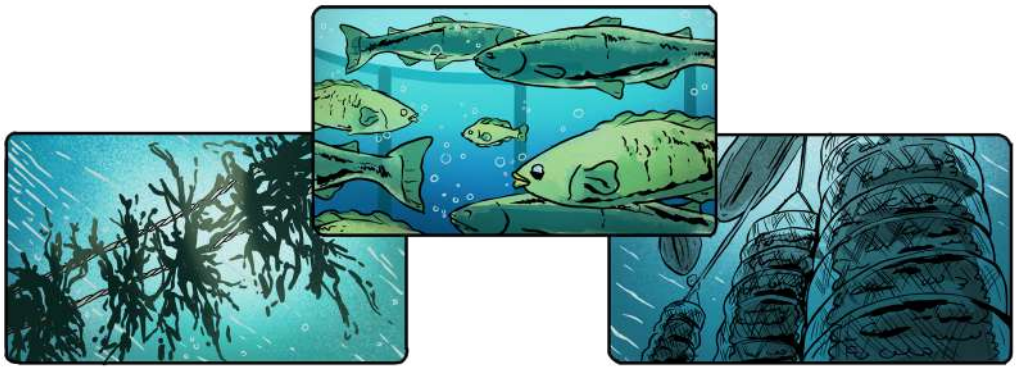
The AZA4ICE project, co-funded by the European Union via Interreg Euro-MED Programme, was created to address these challenges. Its mission is to accelerate the transition towards an inclusive and circular aquaculture economy — one where resources are reused, waste is minimized, and communities thrive alongside nature. By focusing on close-to-coast and inland waters, AZA4ICE taps into ecosystems with great potential for local economies, sustainable food production, and resilient environments, promoting Allocated Zones for Circular Aquaculture as a key tool for planning and cooperation.

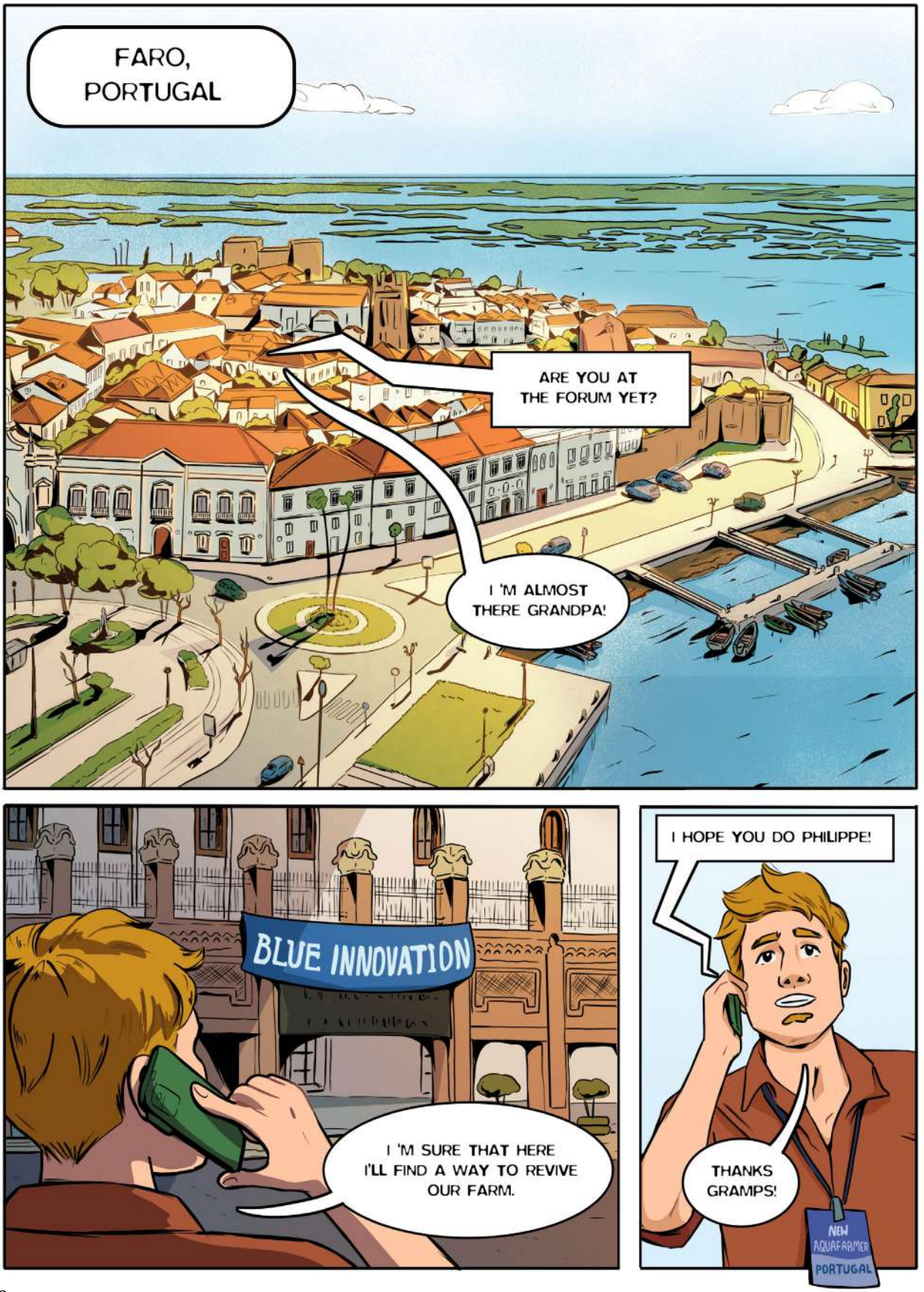
By connecting tradition with innovation, AZA4ICE builds on partners' expertise and promotes cross-border knowledge exchange, creating a truly Euro-Mediterranean effort. Its pioneering approach goes beyond conventional aquaculture planning, testing circular practices in areas often overlooked — lagoons, lakes, estuaries, and coastal zones.
This comic book is part of that effort. Through storytelling, it introduces readers to the concepts of circular aquaculture and IMTA (Integrated Multi-Trophic Aquaculture), where algae, oysters, and fish work together in balanced ecosystems that mimic nature. At the same time, it highlights the role of communities, dialogue, and collaboration in shaping sustainable futures.

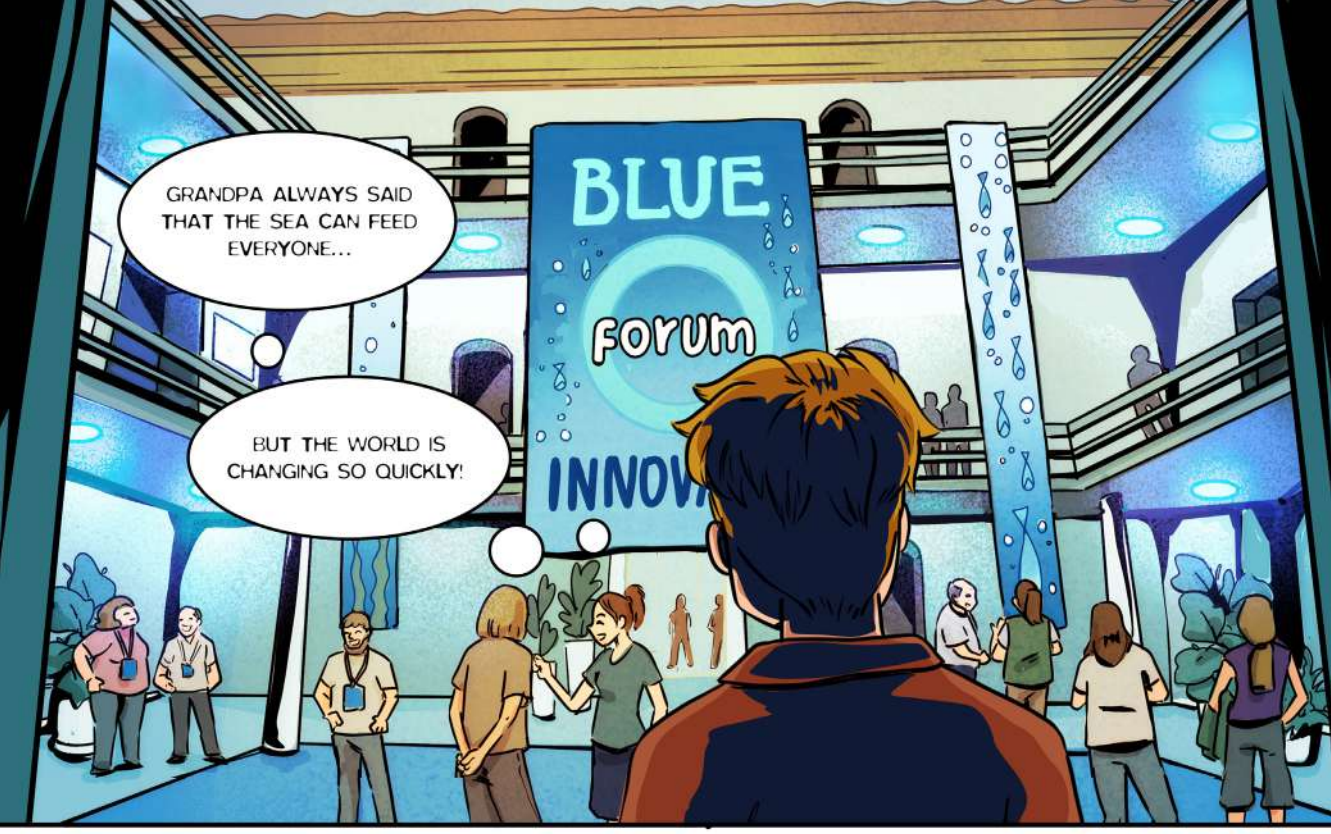
The story you are about to read continues the journey of Philipe, a young man inspired by his grandfather's legacy. From curiosity at a science fair to hands-on action in his hometown, he discovers how innovation, circular practices, and collective responsibility can transform aquaculture — and how knowledge can be passed on to younger generations.

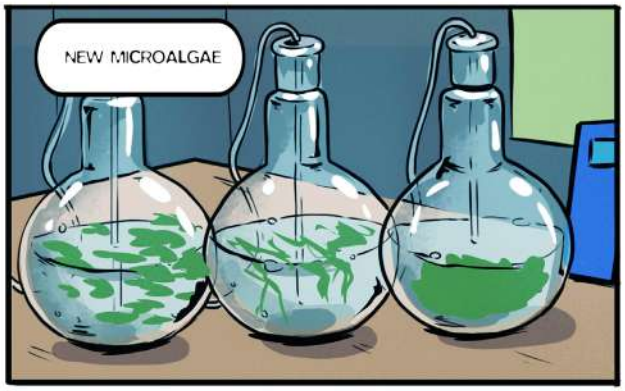
By combining science, culture, and imagination, this comic aims to make aquaculture accessible, relatable, and inspiring. It shows how everyone — from researchers and farmers to students and citizens — can be part of the solution.

Because the future of our seas, our food, and our communities is not written in isolation. It is written together, in dialogue — with hands in the water and eyes on the future.



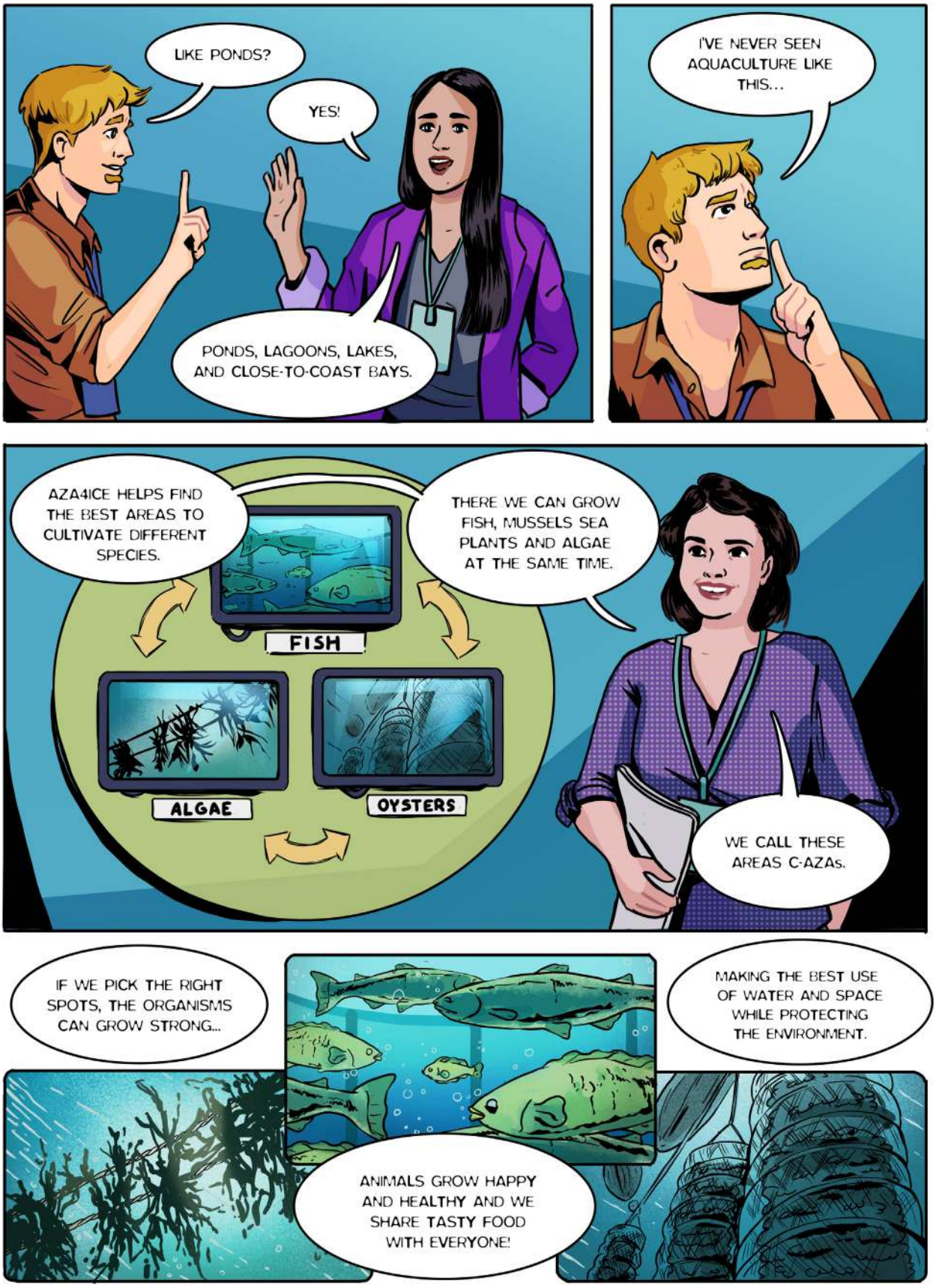

FARO, PORTUGAL
ARE YOU AT THE FORUM YET?
I 'M ALMOST THERE GRANDPA!
BLUE INNOVATION
I 'M SURE THAT HERE I'LL FIND A WAY TO REVIVE OUR FARM.
I HOPE YOU DO PHILIPPE!
THANKS GRAMPS!
NEW AQUAFARMER PORTUGAL



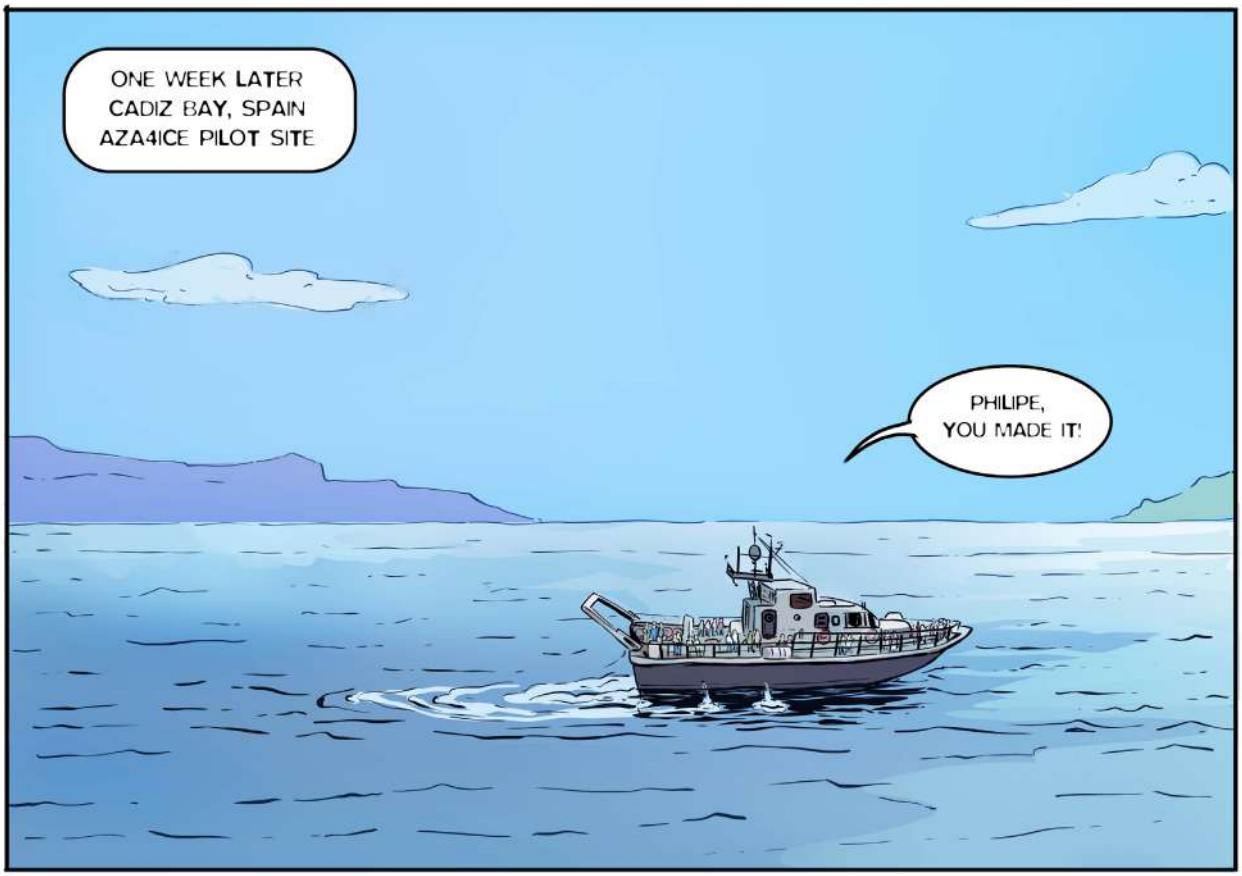


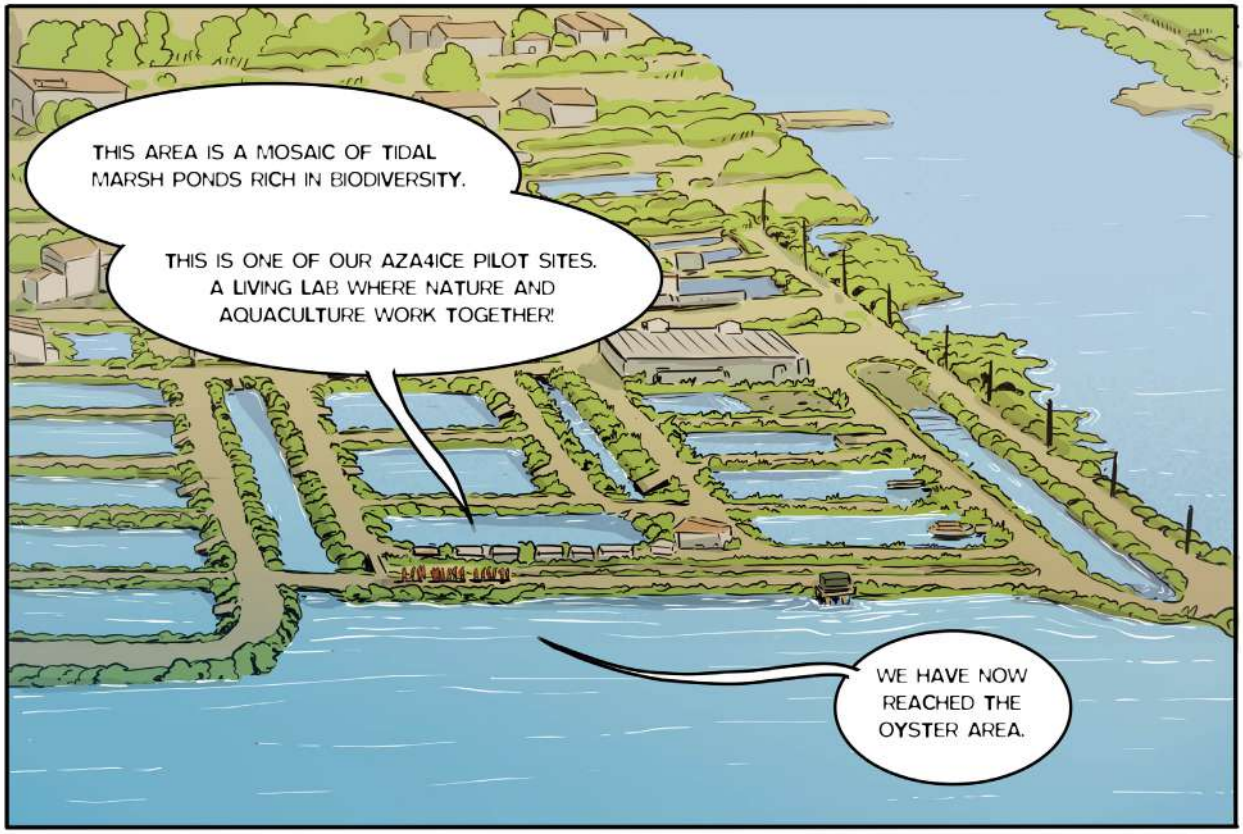
NOW IT'S OUR GENERATION'S CHANCE TO DO THINGS BETTER!

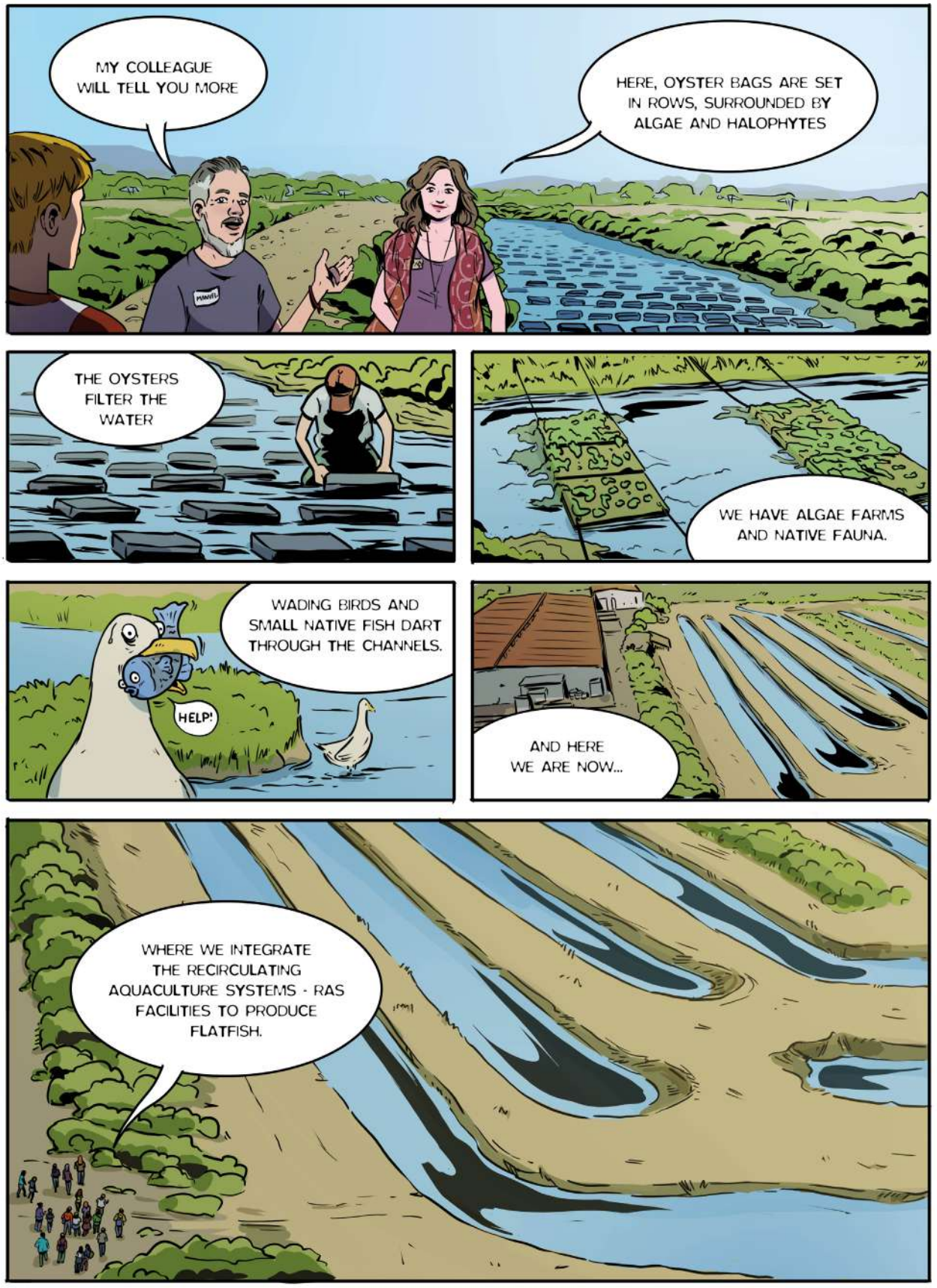

WOAH! WHAT IS THAT?
WELCOME TO THE AZA4ICE BOOTH!
AZA4ICE
HELLO! CAN I ASK A QUESTION ABOUT YOUR BOOTH?
YES, WE'D BE HAPPY TO ANSWER!
IS THIS SHOWING SOME NEW KIND OF FISH FARM?
FISH
ALGAE
OYSTERS
THIS IS A FISH FARM THAT MIMICS NATURE IN DIFFERENT AQUATIC ENVIRONMENTS!


LIKE PONDS?
YES!
PONDS, LAGOONS, LAKES, AND CLOSE-TO-COAST BAYS.
I'VE NEVER SEEN AQUACULTURE LIKE THIS...
AZA4ICE HELPS FIND THE BEST AREAS TO CULTIVATE DIFFERENT SPECIES.
THERE WE CAN GROW FISH, MUSSELS SEA PLANTS AND ALGAE AT THE SAME TIME.
FISH
ALGAE
OYSTERS
WE CALL THESE AREAS C-AZAs.
IF WE PICK THE RIGHT SPOTS, THE ORGANISMS CAN GROW STRONG...
MAKING THE BEST USE OF WATER AND SPACE WHILE PROTECTING THE ENVIRONMENT.
ANIMALS GROW HAPPY AND HEALTHY AND WE SHARE TASTY FOOD WITH EVERYONE!


WE CALL THIS "IMTA". INTEGRATED MULTI-TROPIC AQUACULTURE.
IN IMTAs, VARIOUS SPECIES ARE CULTIVATED TOGETHER. FISH ARE FED AND GROW HEALTHY, OYSTERS ACT LIKE NATURAL FILTERS, ALGAE AND PLANTS FULLY CLEAN THE WATER.
AZA4ICE COMBINES SMART SPATIAL PLANNING WITH CIRCULAR ECONOMY PRINCIPLES... AND IT'S CHANGING EVERYTHING!
THIS IS AWESOME! THIS COULD SAVE GRANDPA'S POND...
AZA4ICE
SCAN THE CODE AND JOIN US FOR A FIELD VISIT IN CADIZ
THIS IS AN AMAZING OPPORTUNITY!
" PLIKI PLIKI
GRANDPA
I found something big.
Cádiz next week.
I'll explain everything!
You'll love it!


ONE WEEK LATER
CADIZ BAY, SPAIN
AZA4ICE PILOT SITE
PHILIPE, YOU MADE IT!


THIS AREA IS A MOSAIC OF TIDAL MARSH PONDS RICH IN BIODIVERSITY.
THIS IS ONE OF OUR AZA4ICE PILOT SITES. A LIVING LAB WHERE NATURE AND AQUACULTURE WORK TOGETHER!
WE HAVE NOW REACHED THE OYSTER AREA.


MY COLLEAGUE WILL TELL YOU MORE
HERE, OYSTER BAGS ARE SET IN ROWS, SURROUNDED BY ALGAE AND HALOPHYTES
THE OYSTERS FILTER THE WATER
WE HAVE ALGAE FARMS AND NATIVE FAUNA.
WADING BIRDS AND SMALL NATIVE FISH DART THROUGH THE CHANNELS.
HELP!
AND HERE WE ARE NOW...
WHERE WE INTEGRATE THE RECIRCULATING AQUACULTURE SYSTEMS - RAS FACILITIES TO PRODUCE FLATFISH.


SO ALL THESE ORGANISMS GROW SIDE BY SIDE?
YES! EVERYTHING IS CONNECTED. LIKE A LIVING PUZZLE!
THIS... THIS COULD CHANGE EVERYTHING BACK HOME!


NATURE RECYCLES, AND SO CAN WE!


GET READY GRANDPA! WE'RE GOING CIRCULAR!
00:00:40
HD

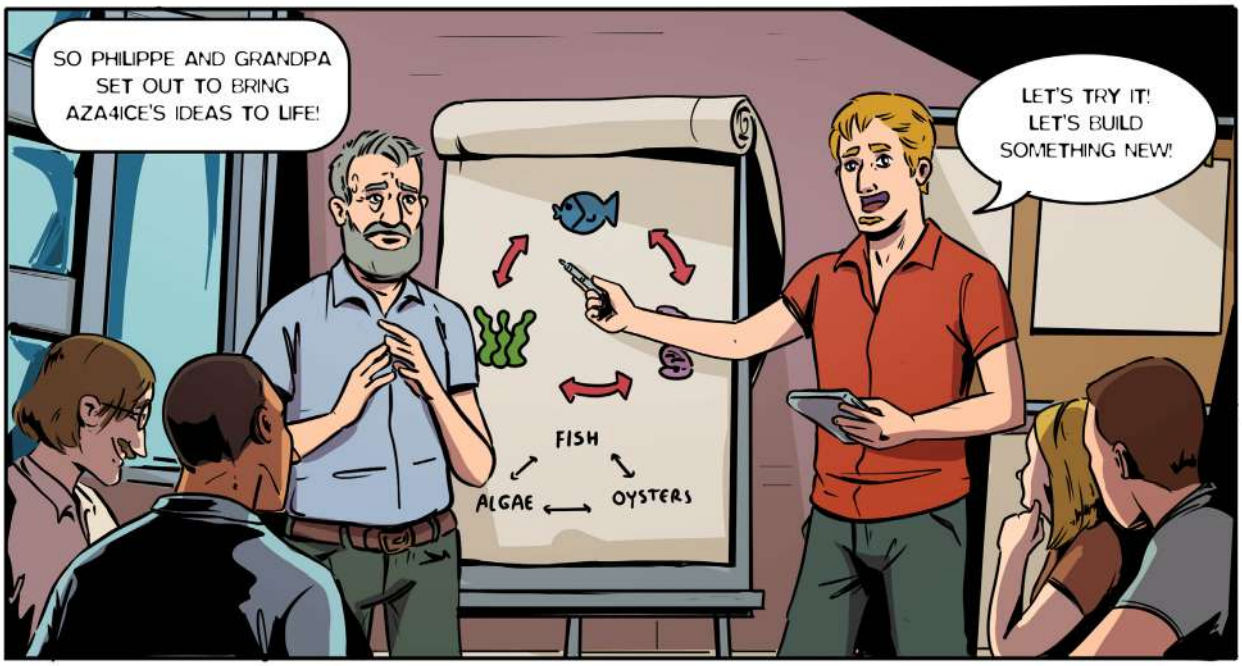

NEXT DAY AT THE COMMUNITY CENTRE NEAR THE PILOT SITE
WELCOME TO THE LiRRIEs WORKSHOP EVERYONE!

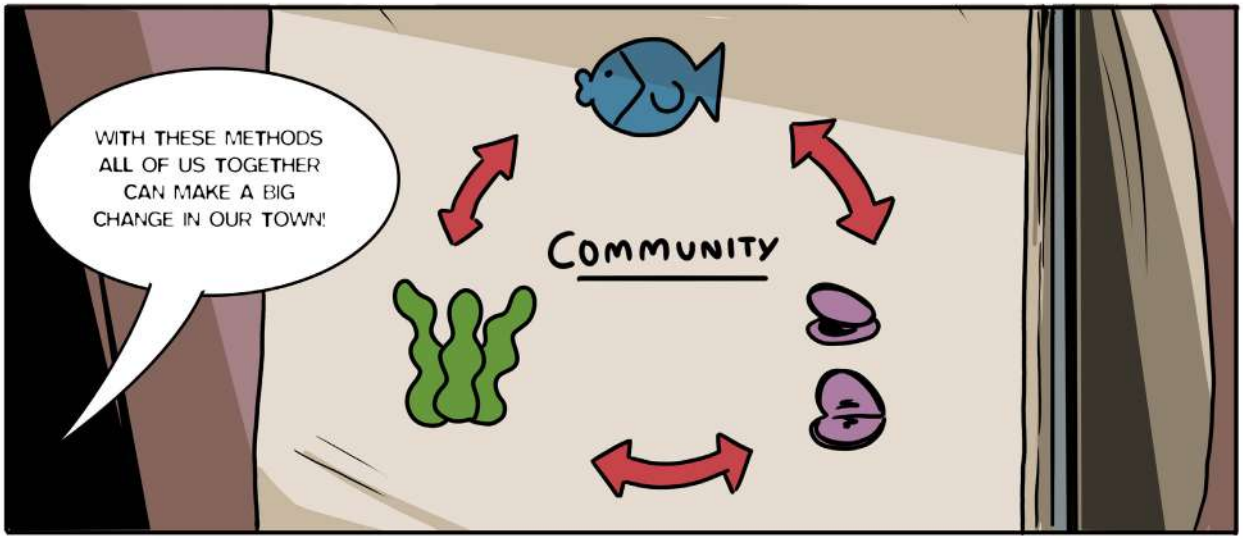

Welcome to the AZA4ICE LiRRIEs
-Living Responsible Research and Innovation Ecosystems-
HERE, FIVE TYPES OF VOICES COME TOGETHER: SCIENCE, BUSINESS, AUTHORITIES, CITIZENS AND NATURE ADVOCATES.

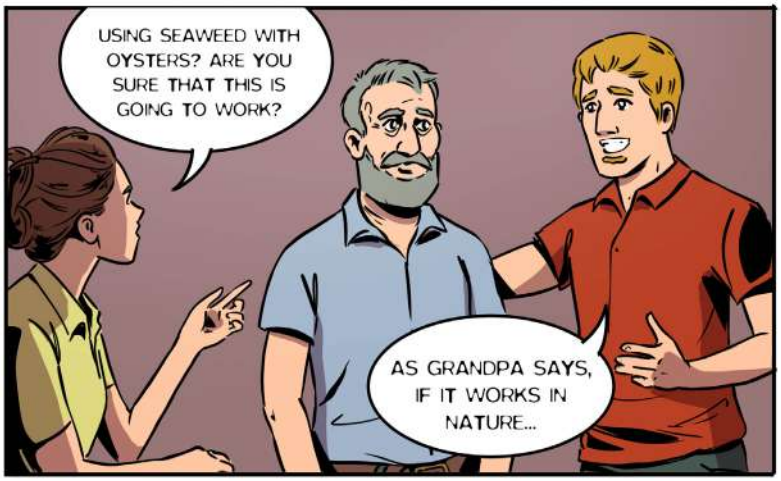

Cleaner water & better visibility near farms
C-AZAs help reduce pollution and improve water quality by promoting circular aquaculture practices
Skills & training for farmers and staff
Everyone, from fishers to scientists, has a voice in shaping aquaculture's future.
YOU ARE ENCOURAGED TO SHARE YOUR VIEWS.
DOES ANYONE HAVE A QUESTION?
I HAVE A CONCERN I WOULD LIKE TO VOICE!
I'M NOT SURE ABOUT CHANGING THE WAY WE'VE ALWAYS DONE THINGS... WE CAN'T JUST FLIP OUR METHODS OVERNIGHT!


TRUE, BUT SMALL STEPS LIKE IMTA, HELP REDUCE RISK AND POLLUTION.
WE ARE ALSO SIMPLIFYING LICENSES TO MAKE SUSTAINABLE METHODS EASIER TO ADOPT.
WE ARE RECOMMENDING INCENTIVES FOR BUSINESSES TOWARDS CIRCULARITY IN AQUACULTURE.
WHAT IF WE COULD LEARN AQUACULTURE IN SCHOOLS?
WHAT IF WE CREATED A BOARDGAME TO TEACH KIDS ABOUT THIS?
BRILLIANT IDEA! THAT'S COMMUNITY DRIVEN INNOVATION IN ACTION!
AFTER ALL, INNOVATION ISN'T JUST TECH. IT'S LISTENING, LEARNING...
AND BUILDING TOGETHER!

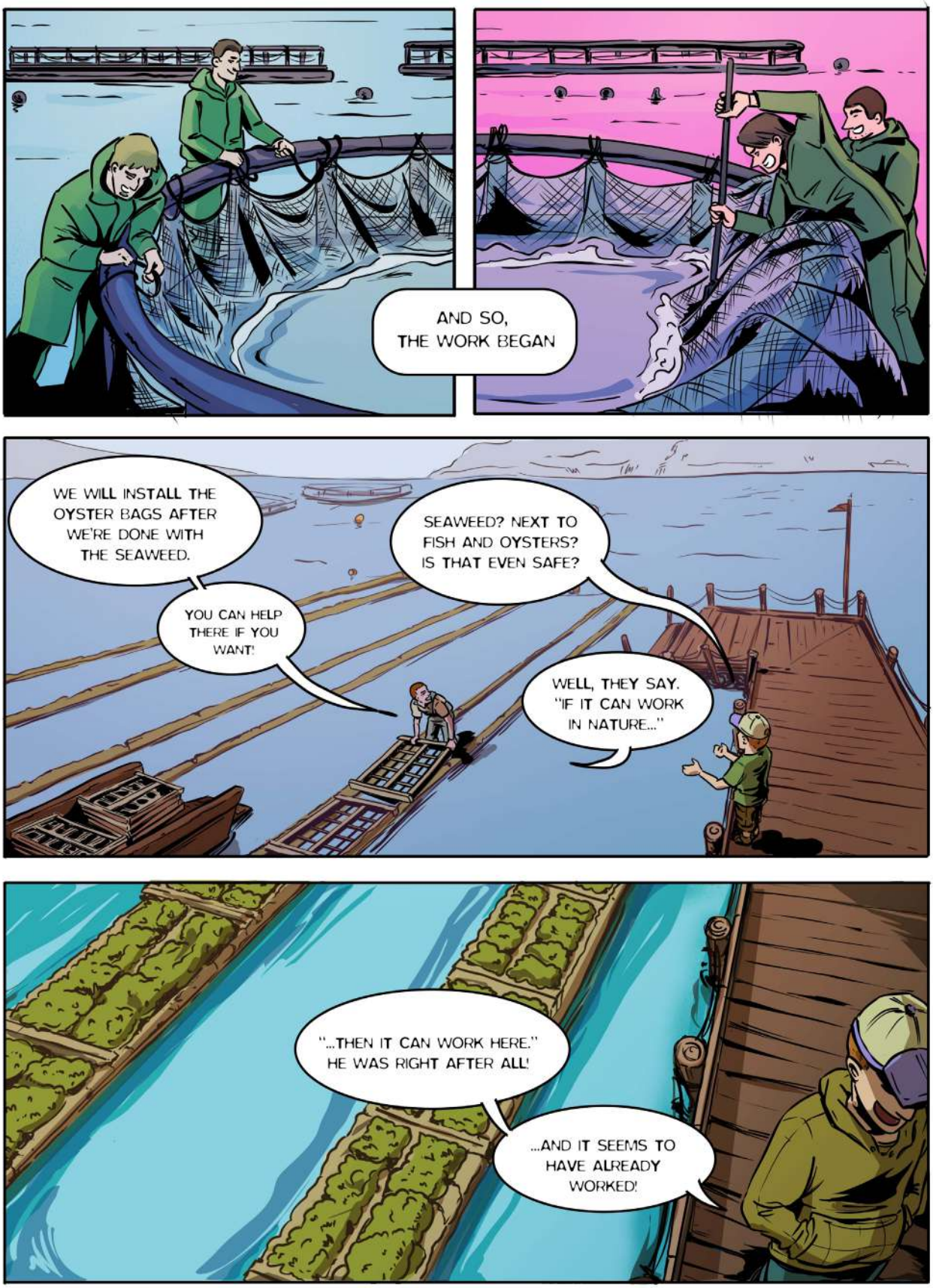

WEEKS LATER
PHILIPPE'S HOME TOWN
PHILIPPE, HERE!
I SEE YOU GRANDPA!
I'VE MISSED YOU BOY!
ME TOO!
THE VILLAGE ISN'T LOOKING GOOD THOUGH.
CLOSED
YES, THE TOWN IS REALLY STRUGGLING WITH OVERFISHING LATELY
NOW THAT WE KNOW WHAT TO DO WE MUST ACT FAST BEFORE THINGS GET WORSE!

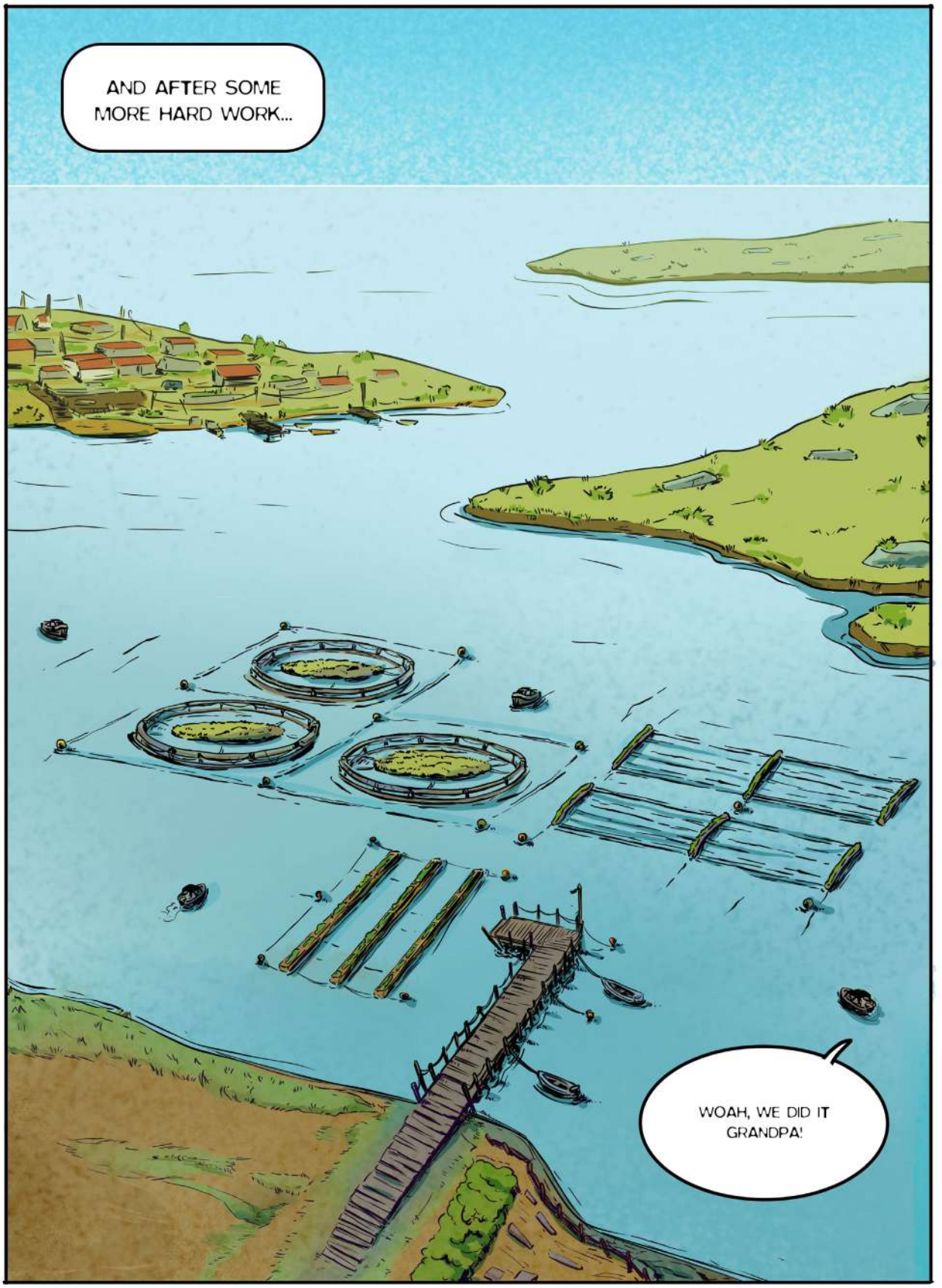

SO PHILIPPE AND GRANDPA SET OUT TO BRING AZA4ICE'S IDEAS TO LIFE!
LET'S TRY IT! LET'S BUILD SOMETHING NEW!
FISH
ALGAE
OYSTERS

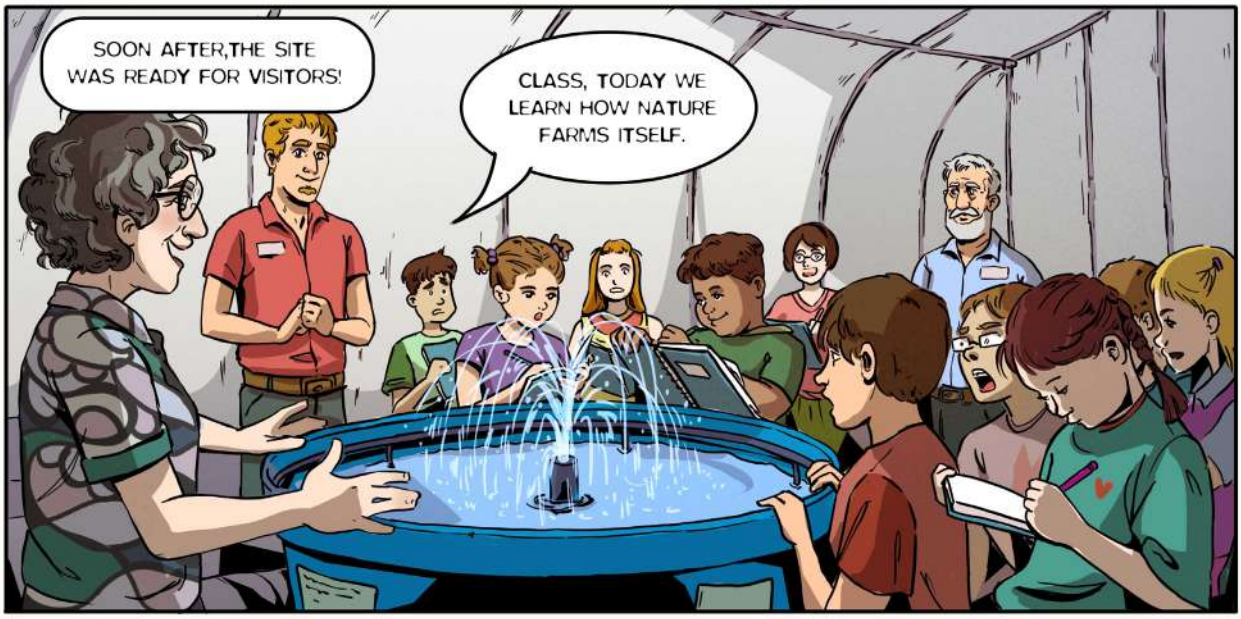

WITH THESE METHODS ALL OF US TOGETHER CAN MAKE A BIG CHANGE IN OUR TOWN!
COMMUNITY


USING SEAWEED WITH OYSTERS? ARE YOU SURE THAT THIS IS GOING TO WORK?
AS GRANDPA SAYS, IF IT WORKS IN NATURE...


IT CAN WORK HERE AS WELL!


AND SO,
THE WORK BEGAN
WE WILL INSTALL THE OYSTER BAGS AFTER WE'RE DONE WITH THE SEAWEED.
YOU CAN HELP THERE IF YOU WANT!
SEAWEED? NEXT TO FISH AND OYSTERS? IS THAT EVEN SAFE?
WELL, THEY SAY. "IF IT CAN WORK IN NATURE..."
"...THEN IT CAN WORK HERE." HE WAS RIGHT AFTER ALL!
...AND IT SEEMS TO HAVE ALREADY WORKED!


AND AFTER SOME MORE HARD WORK...
WOAH, WE DID IT GRANDPA!

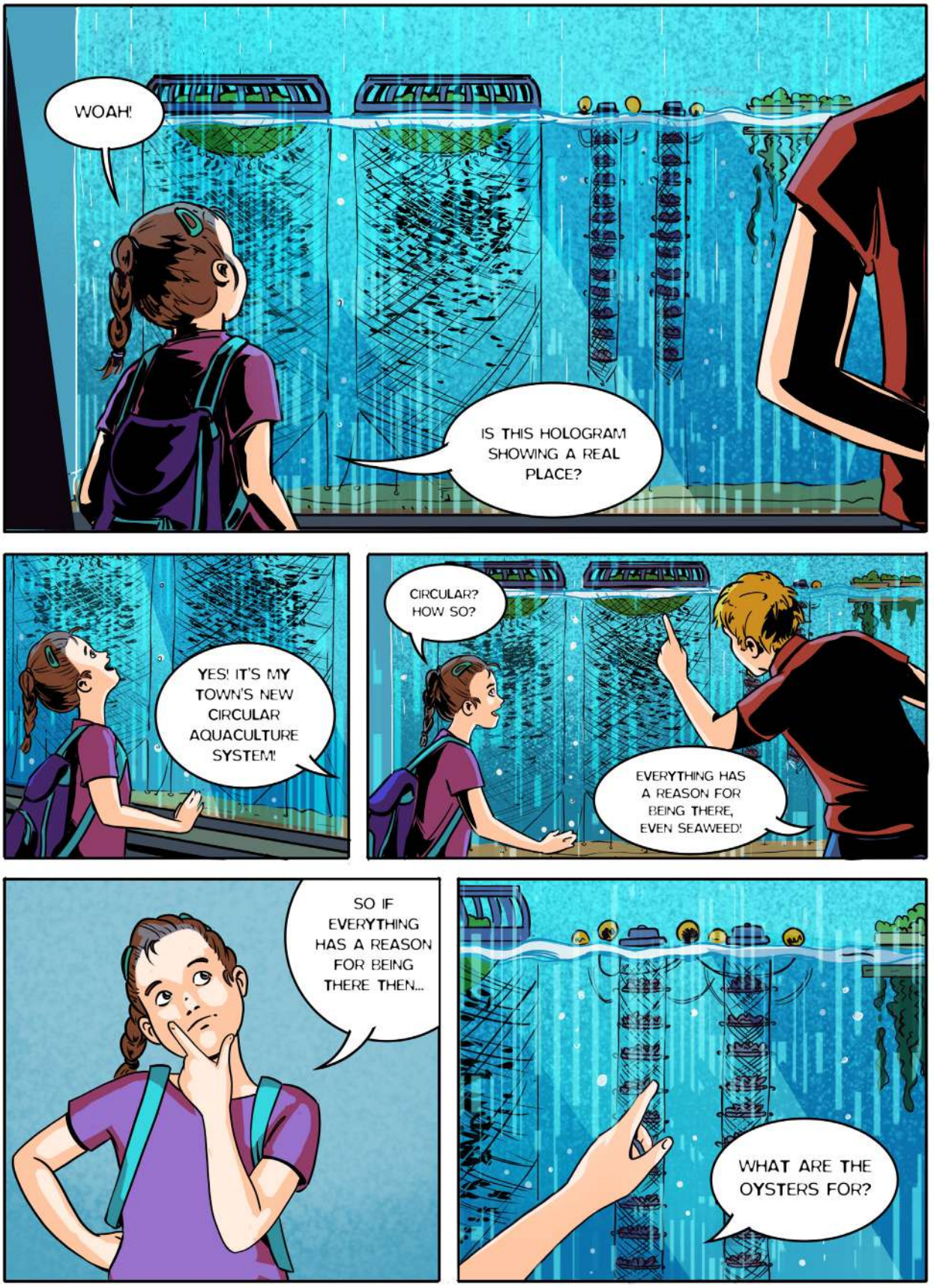

SOON AFTER,THE SITE WAS READY FOR VISITORS!
CLASS, TODAY WE LEARN HOW NATURE FARMS ITSELF.


ARE YOU READY TO VISIT THE SITE?
THIS WAY PLEASE!


AND THIS IS HOW WE MONITOR THE TANKS!
CAN WE TRY NEXT?
NEWS OF THEIR SUCCESS SLOWLY SPREAD ACROSS THE WHOLE COMMUNITY.

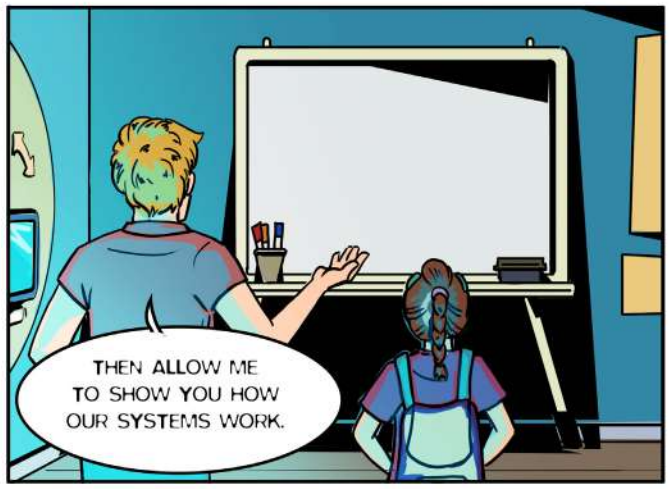

TODAY WE HAVE INSPIRING NEWS!
AQUACULTURE POWERED BY NATURE
THE WHOLE TOWN HAS FELT THE POSITIVE CHANGES OF THE CIRCULAR AQUACULTURE MODEL. WE ARE HERE WITH THE PEOPLE RESPONSIBLE FOR THIS INNOVATION.
HELLO, PHILIPPE!
TELL US, HOW DID YOU COME UP WITH THESE INNOVATIONS?
LIVE
IT TOOK A LOT OF WORK FROM A LOT OF PEOPLE. THE WHOLE COMMUNITY CAME TOGETHER TO CREATE OUR CIRCULAR AQUACULTURE!
NATURE RECYCLES AND SO CAN WE! IF IT WORKS IN NATURE, IT CAN ALSO WORK HERE!
AQUACULTURE: A THRIVING COMMUNITY
CIRCULAR SOLUTIONS LEAD TO SUCCESS
NEWS
5:31

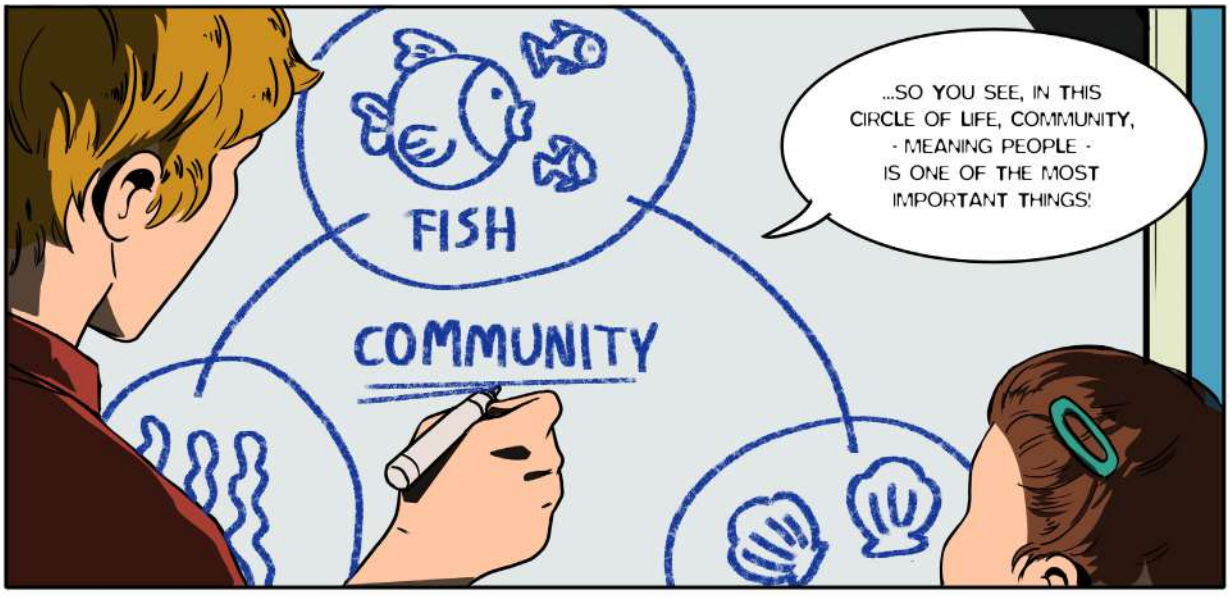

FARO, PORTUGAL
ONE YEAR LATER
AZA4ICE
AQUACULTURE
POWERED BY
NATURE
I'M SO EXCITED TO
SHARE OUR JOURNEY
WITH THE WORLD!
OUR STORY

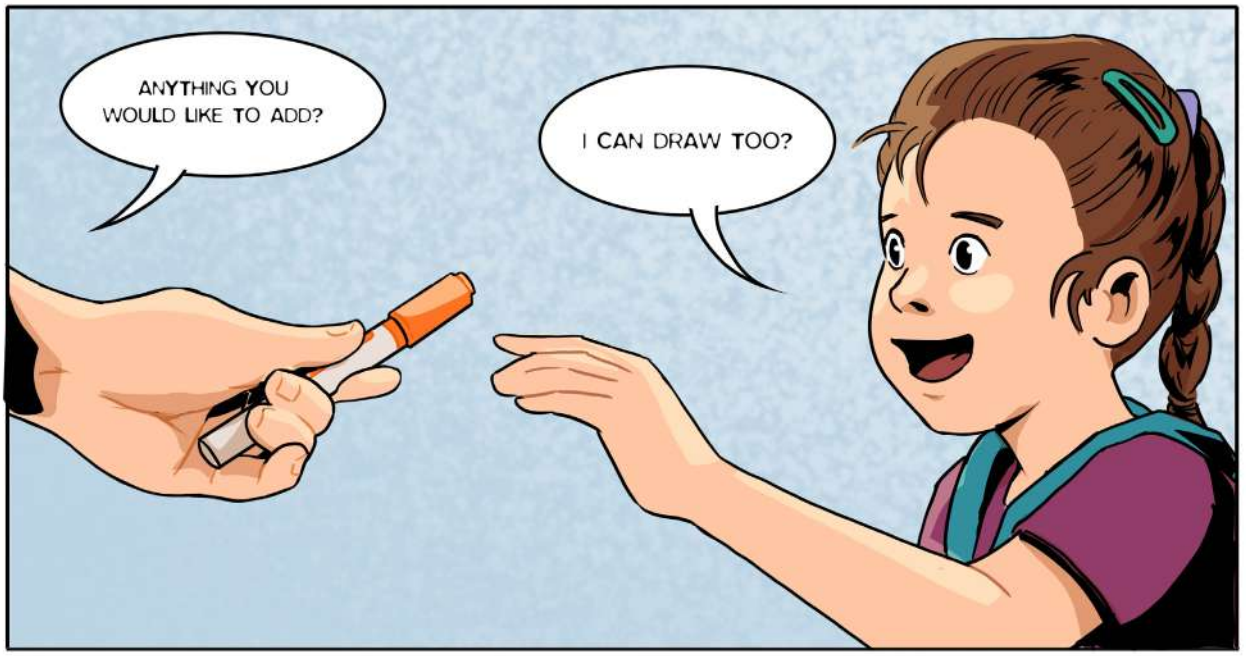

WOAH!
IS THIS HOLOGRAM SHOWING A REAL PLACE?
YES! IT'S MY TOWN'S NEW CIRCULAR AQUACULTURE SYSTEM!
CIRCULAR? HOW SO?
EVERYTHING HAS A REASON FOR BEING THERE, EVEN SEAWEED!
SO IF EVERYTHING HAS A REASON FOR BEING THERE THEN...
WHAT ARE THE OYSTERS FOR?

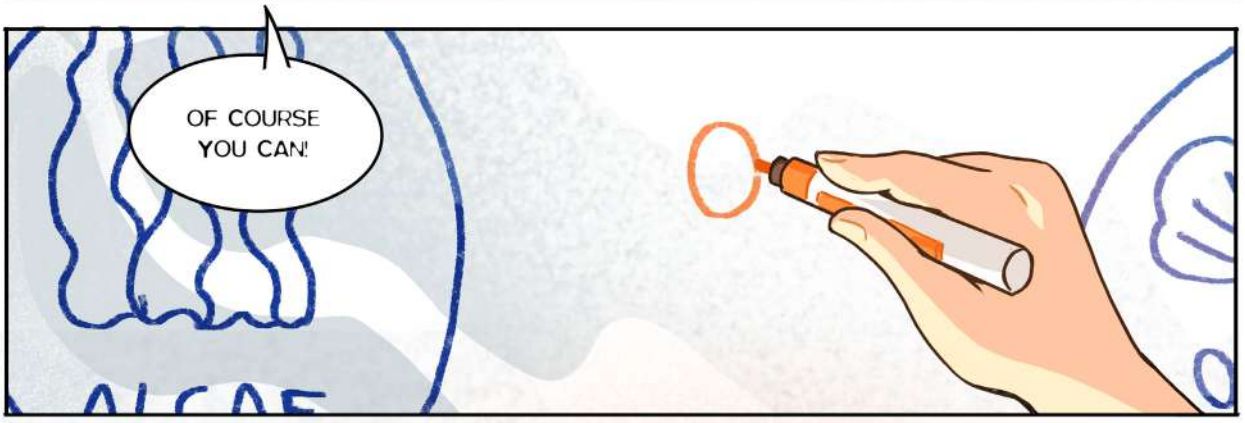

THESE OYSTERS ARE DOING THEIR PART IN THE CIRCLE OF LIFE BY FILTERING THE WATER.
THE CIRCLE OF LIFE?
I'LL TELL YOU ALL ABOUT IT! DO YOU LIKE DRAWING?

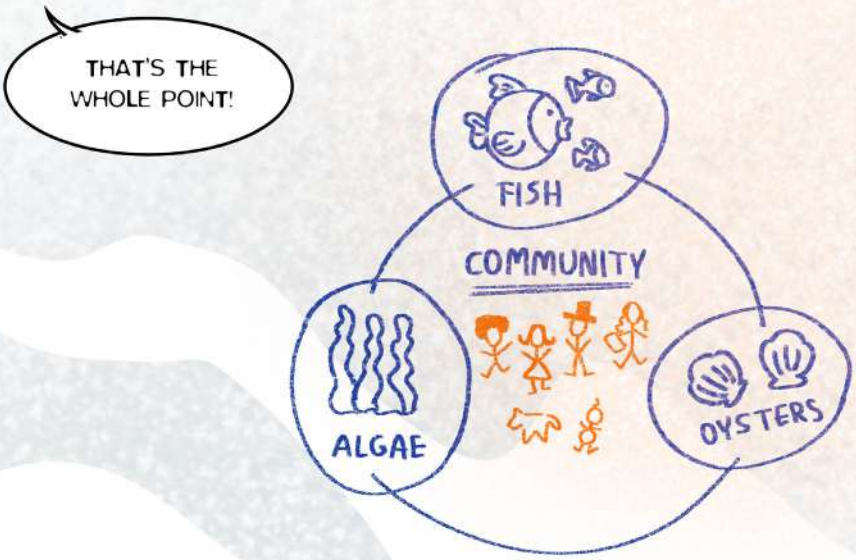

OF COURSE I DO!


THEN ALLOW ME TO SHOW YOU HOW OUR SYSTEMS WORK.


FISH
COMMUNITY
...SO YOU SEE, IN THIS CIRCLE OF LIFE, COMMUNITY, - MEANING PEOPLE - IS ONE OF THE MOST IMPORTANT THINGS!

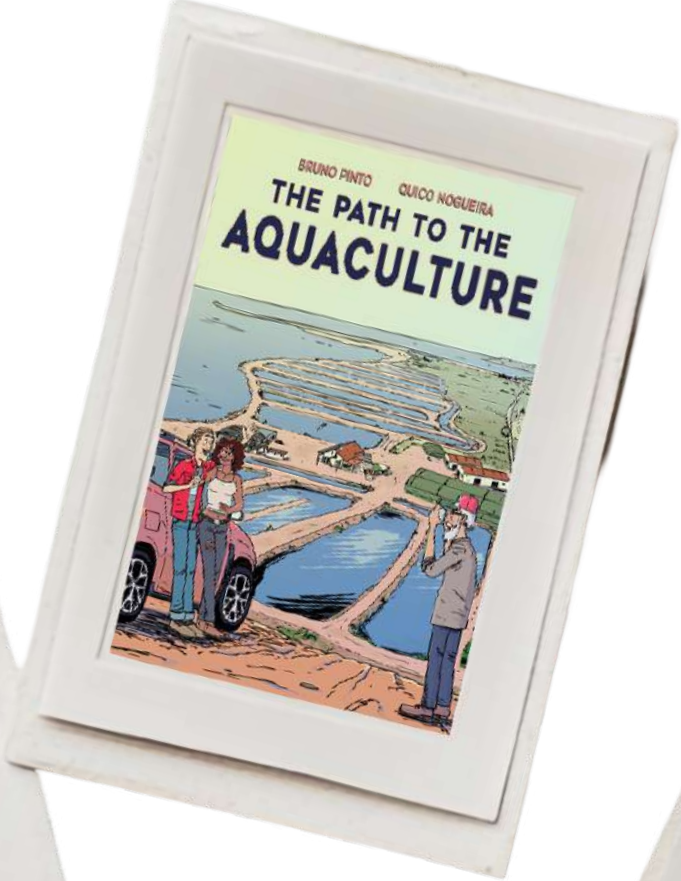

ANYTHING YOU WOULD LIKE TO ADD?
I CAN DRAW TOO?

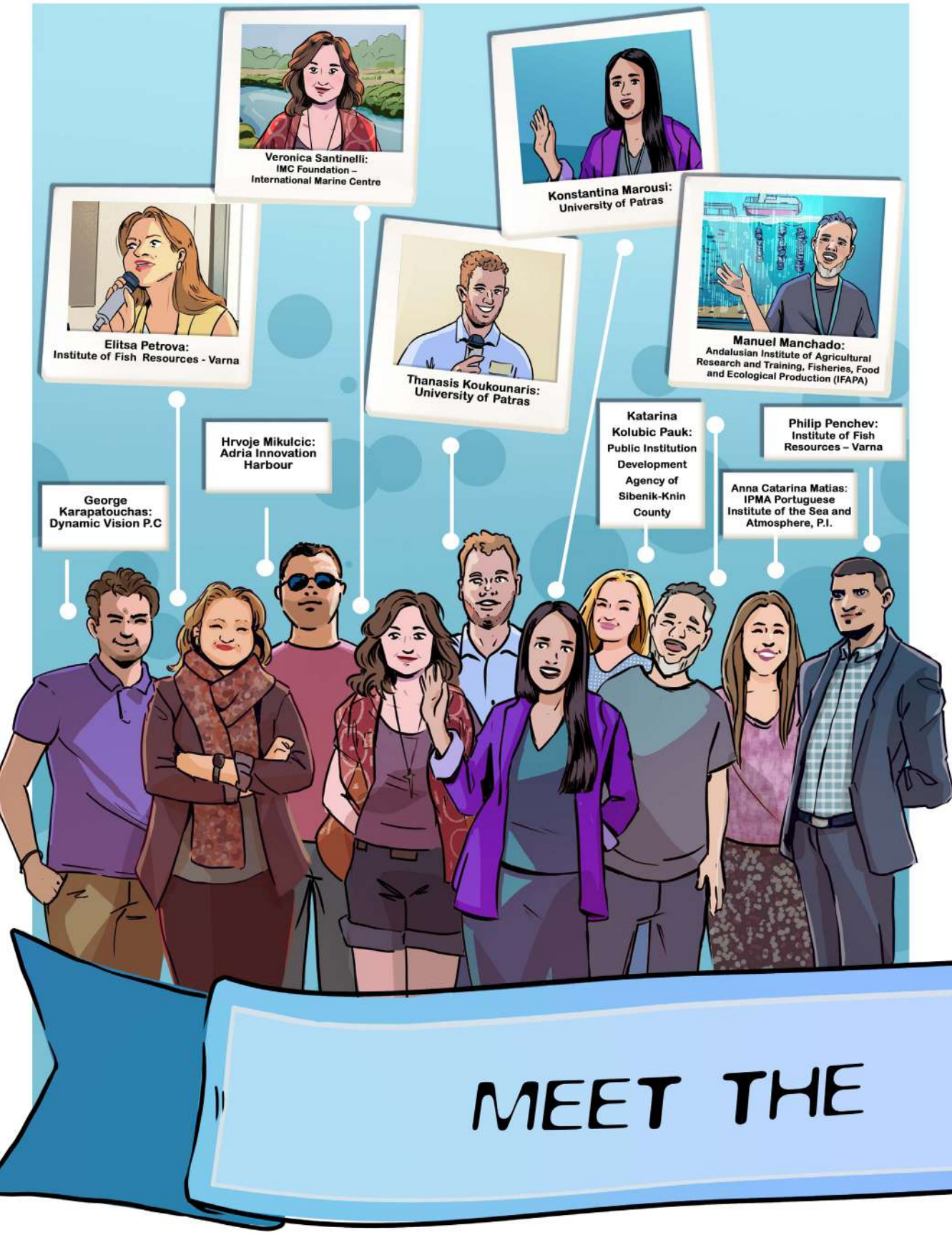

OF COURSE YOU CAN!


THAT'S THE WHOLE POINT!
FISH
COMMUNITY
ALGAE
OYSTERS

END

INSPIRED BY

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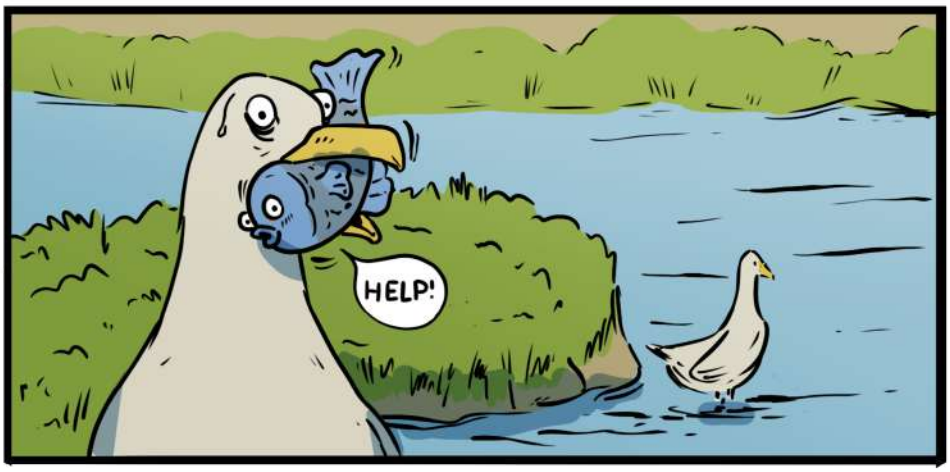
AZA4ICE TEAM

GLOSSARY



What is aquaculture?

Aquaculture is the farming of aquatic organisms — such as fish, molluscs, crustaceans, and algae — in freshwater, coastal, or marine environments. It involves managing the full life cycle of species, from eggs and larvae in controlled hatcheries to juveniles and adults in ponds, tanks, cages, or coastal areas.

What is sustainable aquaculture?

Sustainable aquaculture goes a step further. It ensures that aquatic food production meets today's needs without harming ecosystems or future generations' resources. This means using practices that protect biodiversity, recycle nutrients, minimize waste, respect animal welfare, and coexist with other coastal activities like tourism and fishing.

What is the circular economy?

The circular economy is a way of designing systems where resources are reused, recycled, and kept in use for as long as possible. Instead of "take, use, throw away," it reduces waste and pollution while creating new value from by-product.

What is the blue economy?

The blue economy refers to all economic activities that depend on oceans, seas, and water resources. It includes aquaculture, fishing, shipping, renewable energy, and coastal tourism — aiming to balance economic growth with ocean health.

What is AZA4ICE?

AZA4ICE: Allocated Zones for Circular Aquaculture to trigger the transition to an Inclusive and Circular Economy in aquaculture sector fostering new business opportunities and eco-consciousness society.
AZA4ICE is a European project co-funded by the Interreg Euro-MED Programme. Its goal is to make aquaculture more sustainable, circular, and inclusive. The project focuses on identifying the best areas for aquaculture in close-to-coast and inland waters, promoting circular economy practices, and involving communities, scientists, businesses, and policymakers in co-creating solutions.

What are C-AZAs?

C-AZAs, Allocated Zones for Circular Aquaculture, are specific areas identified through scientific and participatory methods as the most suitable for sustainable aquaculture. They are carefully chosen to balance aquaculture with other coastal activities (like tourism, conservation, and fishing), while applying circular practices such as nutrient recycling, waste reduction, and renewable energy use. This creates opportunities for local jobs, healthy food, and cleaner environments.

What is IMTA?

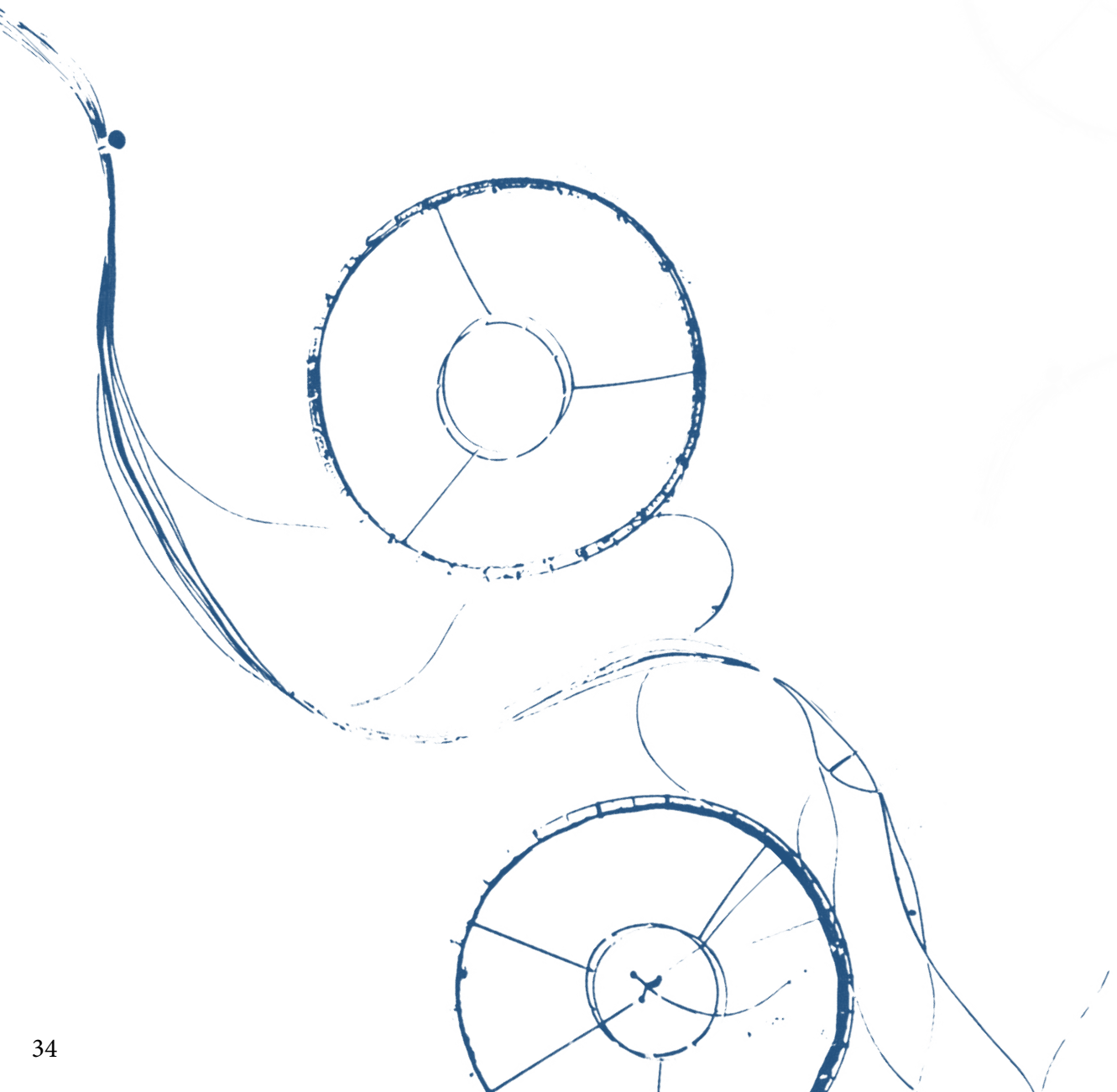
IMTA stands for Integrated Multi-Trophic Aquaculture, a sustainable method that mimics natural ecosystems. It combines species from different levels of the food chain:

- Algae absorb nutrients,
- Oysters and shellfish filter and clean the water,
- Fish complete the cycle as the main cultured species.

By working together, these species improve efficiency, reduce waste, and create healthier environments for aquaculture.

What are LiRRIEs?

LiRRIEs: Living Responsible Research and Innovation Ecosystems. They are participatory workshops where different groups — scientists, entrepreneurs, citizens, public authorities, and environmental advocates — come together to co-design solutions for aquaculture. By sharing knowledge and perspectives, LiRRIEs ensure that new aquaculture systems are not only innovative but also fair, inclusive, and widely accepted.



To learn more about AZA4ICE & aquaculture:
www.aza4ice.interreg-euro-med.eu

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