



Circular ➔ **Vision**

Advanced Water Management: Reuse and Resource Recovery

Sustainable ← **Smart**



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Innovation and Technology



FCC Aqualia:

1000 Communities

20 countries

450 WWTP

250 DWTP

25 M people



XXI Century Challenges



- Conventional, centralised and linear approach: old concept of *Cloaca Maxima*



Only recover a small fraction of diluted nutrients

- Municipal WWTP remove 80-90% of the P and >70% of N to fulfil discharge limits



At considerable expense (5 kWh/kg N)

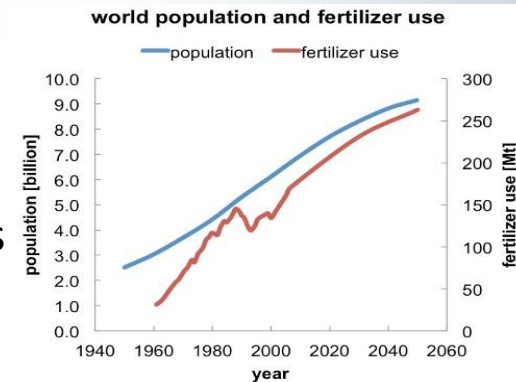
- Highly diluted municipal WW



Nutrient recovery very limited



- Growth and urbanisation of population ↑
- Global demand for food ↑
- Demand for fertilisers ↑



Mengyao Yuan (2014). Data from N. Alexandratos and J. Bruinsma, "World Agriculture Towards 2030/2050: The 2012 Revision," FAO 2012

**Wastewater as
nutrient source!**

XXI Century Challenges – and opportunities- From WW to Resource

Aqualia treats 500 000 000 m³/year of urban WW

Electric consumption associated: $0,5 \text{ kWh}_{\text{el}}/\text{m}^3 = 250 \text{ M kWh} = 25 \text{ M €}$

The energy content of urban WW is typically $\sim 2 \text{ kWh}_{\text{th}}/\text{m}^3$



Situation in Spain:

- ☐ WWTPs >1 % national energy consumption
- ☐ High sludge management costs → **8-20 €/Ton**
- ☐ Difficulties to meet regulation 91/271/CEE: **N & P**
- ☐ Need of water reuse RD 1620/2007
(specially in **stressed areas**)

**Wastewater is
Bioenergy!**

R&D VISION



Areas of work and project portfolio structure

Quality

- ✓MIMAM MBBR Hybacs (2010*)
- ✓INCITE MBR Trainasa (2012*)
- ✓INCITE ELAN Trainasa (2012*)
- ✓CDTI ELAN Vigo aqualia (2013*)
- ✓INNPACTO Filene (2014*)
- ✓ININTERCONECTA Alegría (2014*)
- ✓INNPRONTA ITACA (2014*)
- ✓LIFE Remembrance (2015*)
- ✓INNOVA Inpactar (2015*)
- ✓INNOVA E3N (2017*)
- ✓CONECTA PEME Medrar (2018*)
- ✓WATERWORKS Pioneer (2018*)
- ✓CDTI BESTF2 Biowamet (2018*)
- ✓LIFE Memory (2019*)
- ✓LIFE Methamorphosis (2020)

Eco-efficiency

- ✓ ECO Inno Cleanwater (2017*)
- ✓ RETOS Renovagas (2017*)
- ✓ CIEN SmartGreenGas (2018*)
- ✓ *LIFE Answer (2019)*
- ✓ RIS3 IDEPA Valorastur (2020)
- ✓ H2020 Mides (2020)
- ✓ INTERCONECTA Advisor (2020)
- ✓ WAT.WORKS Maradentro (2021)
- ✓ H2020 Scalibur (2022)
- ✓ H2020 REWATERGY (2023)
- ✓ H2020 BBI Deep Purple (2023)
- ✓ H2020 BBI B-Ferst (2023)

Smart management

- ✓MEC Mantenimiento Predictivo (2012*)
- ✓INNPRONTA IISIS (2014*)
- ✓ININTERCONECTA Smartic (2014*)
- ✓FP7 UrbanWater (2015*)
- ✓ CDTI WAT. JPI Motrem (2017*)
- ✓ *Virtual CSIC (2019)*
- ✓ LIFE icirbus4industries (2020)
- ✓ H2020 Run4Life (2021)

Sustainability

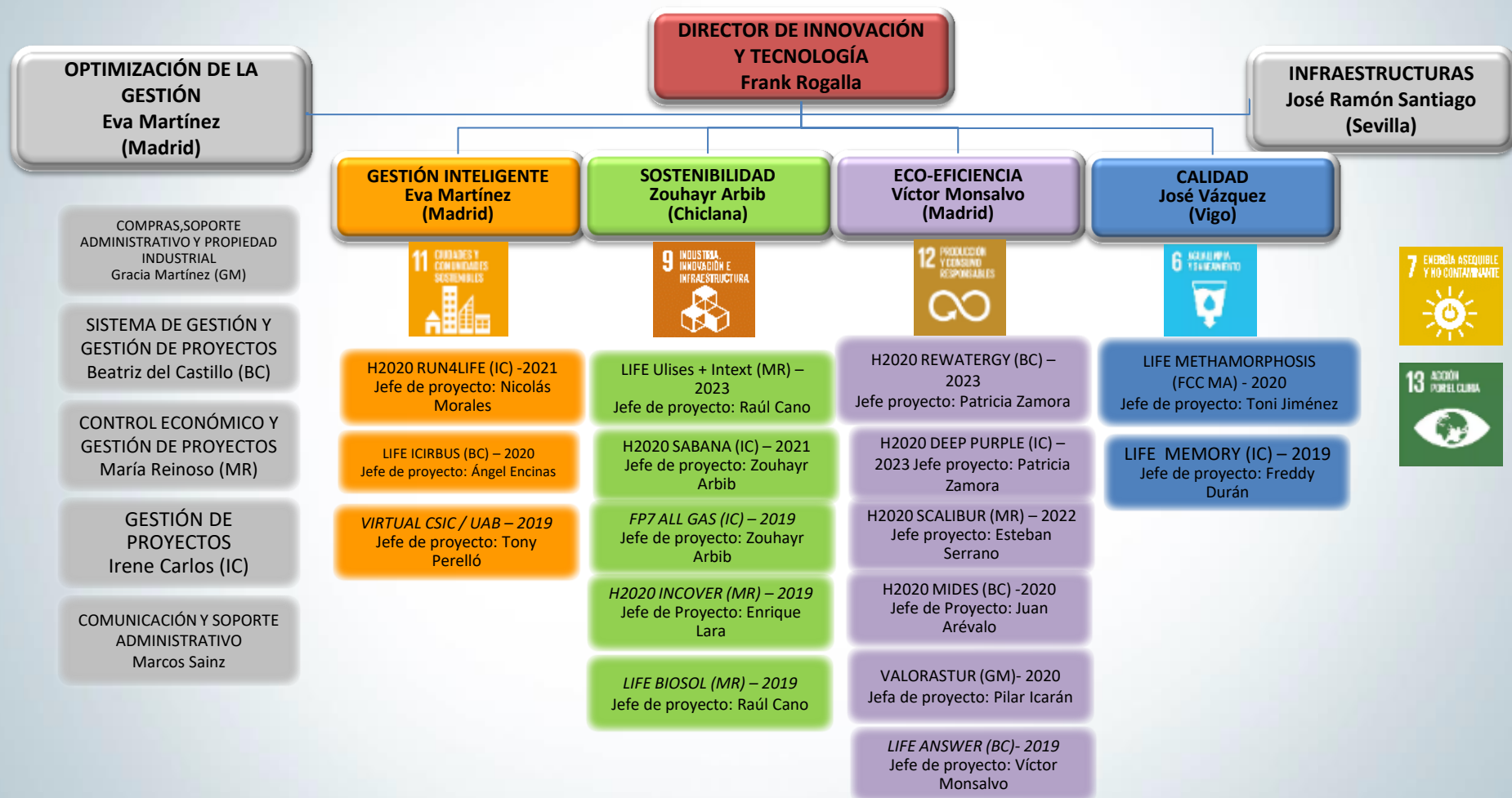
- ✓CDTI Sólidos Sostenibles (2012*)
- ✓FP7 SWAT (2013*)
- ✓CENIT VIDA (2014*)
- ✓IDEA Regenera (2015*)
- ✓INNPACTO Downstream (2015*)
- ✓*LIFE Biosol (2019*)*
- ✓*H2020 Incover (2019*)*
- ✓*FP7 All-gas (2019)*
- ✓H2020 Sabana (2020)
- ✓ *Life Ulises (2022)*
- ✓ *Life IntExt (2023)*

(*) Finished projects: 26 + 6 in 2019

To be finished in 2020: 6

Currently in developent: 14

Areas of work aligned with the ODS



“Innovation is in the core of the corporate culture of Aqualia”. Felix Parra (CEO)



Total 33 - 42 % Women

Age 80 % < 40 años

Internal company mobility

Aqualia and the “Circle of LIFE”: Projects of Circular Economy



METHAMORPHOSIS



ICIRBUS

ANSWER

MEMORY



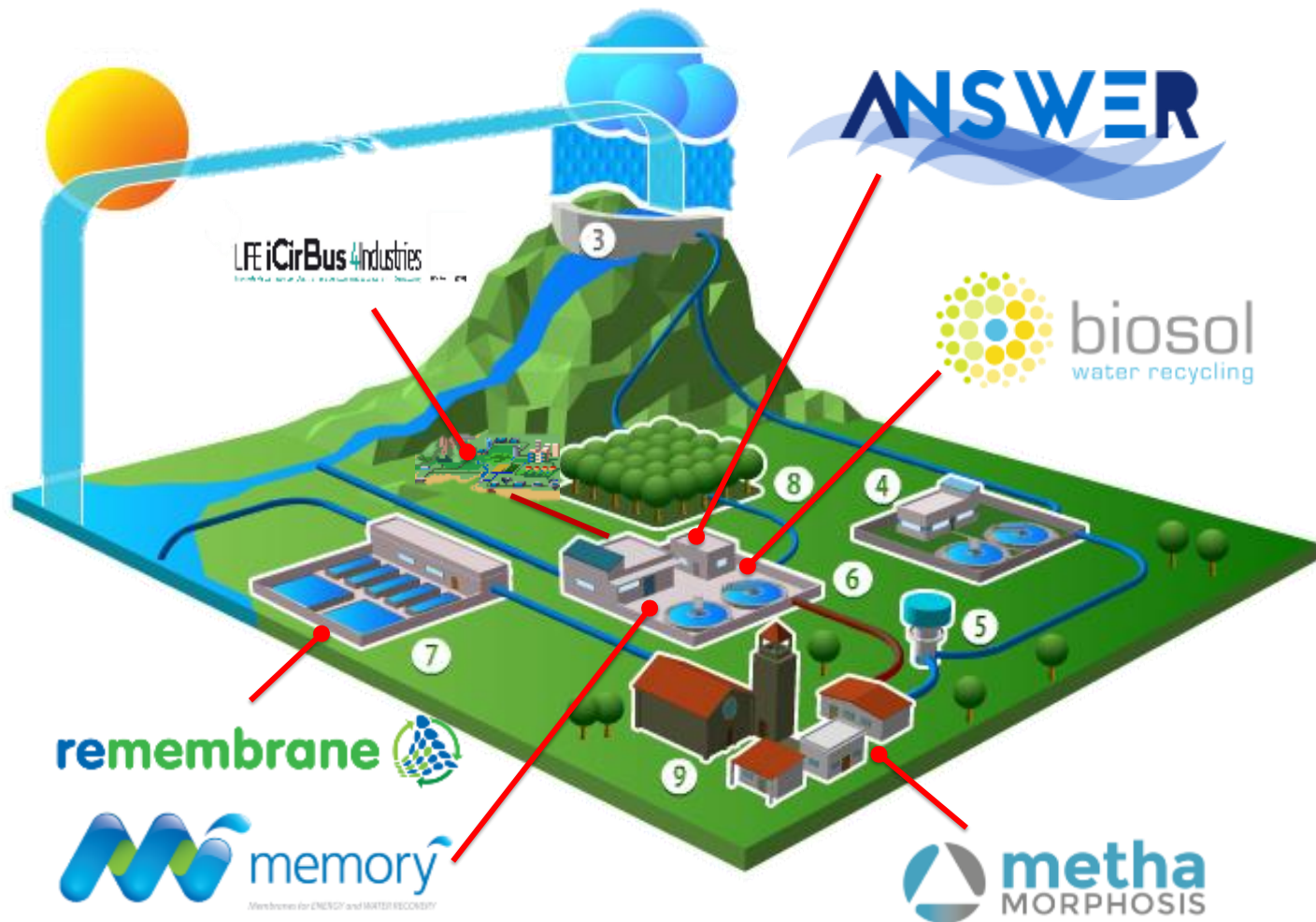
REMEMBRANCE

BIOSOL

**INTEXT
ULISES**



aqualia: Life in the integral cycle of water management



New LIFE projects!

LIFE ULISES - Upgrading wastewater treatment plants towards energy self-sufficiency and zero-waste concept :

“ABAD Almeria”

Coordinator: Aqualia

Total budget: 2,9 M€



LIFE INTEXT– INTensificacion de sistemas EXTensivos de plantas depuradoras en pequeños entornos urbanos mediante control remoto y optimización

“Centa 2 en Talavera – pequeñas poblaciones”

Coordinator: Aqualia

Total budget: 1,9 M€

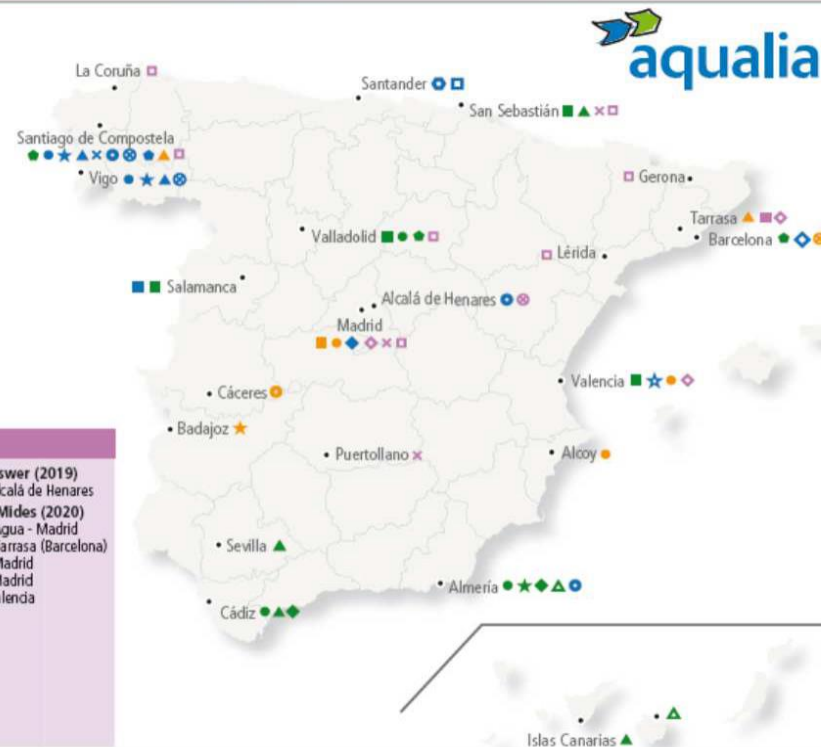


R&D to become smarter.... Decentralized and in collaboration

Collaboration with universities and research centres

National

Sustainability	Quality	Smart Services
- CDTI Sólidos Sostenibles (2012*) AINIA - Valencia CEIT - San Sebastián USAL - Salamanca UVA - Valladolid UPV - Valencia - CENIT Vida (2014*) Fundación Cajamar - Almería UCA - Cádiz UVA - Valladolid - IDEA Regenera (2015*) UAL - Almería - INNPACTO Downstream (2015*) ITC - Canarias TECNALIA - San Sebastián UCA - Cádiz - FP7 All-gas (2018) UAL - Almería UCA - Cádiz IMDEA Energía - Madrid - LIFE Biosol water recycling (2018) CENTA - Sevilla - H2020 Incover (2019) AIMEN - Galicia UPC - Barcelona UVA - Valladolid IMDEA Energía - Madrid - H2020 Sabana (2020) UAL Almería U. Las Palmas (Canarias)	- MIMAM MBBR Hybacs (2010*) USAL - Salamanca - INCITE MBR Trainasa (2012*) U. Vigo - INCITE ELAN Trainasa (2012*) U. Vigo USC - Santiago de Compostela - CDTI ELAN Vigo Aqualia (2013*) U. Vigo USC - Santiago de Compostela - INNPACTO Filene (2014*) UCM - Madrid - ININTERCONECTA Alegria (2014*) USC - Santiago de Compostela - INNPRONTA Itaca (2014*) UAH - Alcalá de Henares UAL - Almería USC - Santiago de Compostela - INNOVA Impactar (2015*) U. Cantabria - Santander - INNOVA E3N (2017) U. Cantabria - Santander - LIFE Memory (2018) UPV / UV - Valencia - LIFE Methamorphosis (2019) Instituto Catalán de la Energía - Barcelona - CONECTA PEME Medrar (2018) USC - Santiago de Compostela U. Vigo - CDTI WATER WORKS Pioneer STP (2019) USC - Santiago de Compostela	- INNPRONTA IISIS (2014*) IMDEA Agua - Madrid UPV - Alcoy UV / UPV - Valencia - ININTERCONECTA Smartic (2014*) UEX - Badajoz - CDTI WATER JPI Motrem (2017) URJC Madrid - LIFE Icirbus (2020) Intromac - Cáceres - D.I. Virtual CSIC UAB (2020) UAB - Barcelona IIA-CSIC - Barcelona - H2020 Run4Life (2021) USC - Santiago de Compostela Leitat - Tarrasa (Barcelona)
Eco-efficiency		
- LIFE Remembrance (2015*) Leitat - Tarrasa (Barcelona) - RETOS Renovagas (2017) CNH2 - Puertollano CSIC-IPC - Madrid TECNALIA - San Sebastián - CIEN Smart green gas (2018) U. Girona - Girona U. Lleida - Lleida USC - Santiago de Compostela UVA - Valladolid UCM - Madrid ICRA - Girona TECNALIA - San Sebastián DiagnóstiQA - A Coruña - LIFE Answer (2019) UAH - Alcalá de Henares - H2020 Mides (2020) IMDEA Agua - Madrid Leitat - Tarrasa (Barcelona) URJC - Madrid UAM - Madrid UPV - Valencia		



International

Sustainability	Quality
- FP7 Swat (2013*) IGV - Germany - FP7 All-gas (2018) Fraunhofer Gesellschaft Umsicht - Germany Southampton U. - UK - H2020 Incover (2019) Aarhus U. - Denmark Danish Technological Institute - Denmark Helmholtz Zentrum Für Umweltforschung - Germany - H2020 Sabana (2020) U. Milano - Italy Széchenyi István U. - Hungary Karlsruher Institut fuer Technologie - Germany Mikrobiologický Ústav - Centrum Algatech - Czech Rep	- CDTI BESTF2 Blowamet (2018) Southampton U. - UK TU Delft - The Netherlands - CDTI WATER WORKS Pioneer STP (2018) TU Denmark - Denmark U. of Verona - Italy
Smart Services	
- FP7 UrbanWater (2015*) U. Zagreb - Croatia - CDTI Water JPI Motrem (2017) U. Helsinki - Finland U. Stuttgart - Germany U. Torino - Italy - H2020 Run4Life (2021) Wageningen U. - The Netherlands Swedish U. of Agricultural Sciences - Sweden	
Eco-efficiency	
H2020 Mides (2020) Ecole Nationale d'Ingenieurs de Gabes - Tunisia IHE-UNESCO - The Netherlands	



R&D reputation

	2015	2016	2017	2018	2019
Scientific articles	4	4	11	12	9
Sectoral Press	63	163	117	131	69
General Press	37	161	113	94	100
International events	20	40	33	24	19
Spanish events	5	20	18	30	16
Other	1			2	
TOTAL	130	388	292	293	213

04/07/2019

All-gas, la apuesta de Aqualia para avanzar hacia una economía verde y descarbonizada

La compañía ha abierto las puertas de la depuradora de El Torno, en Chiclana (Cádiz), para presentar los avances hacia una economía circular a través de la gestión sostenible del servicio del ciclo integral del agua

El alcalde de Chiclana y el director general del Agua del Ministerio de Transición Ecológica han acompañado a Aqualia y a cerca de un centenar de investigadores en su visita a la planta

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Aqualia ha organizado un evento en las instalaciones de la ds en Chiclana (Cádiz), para presentar los avances del medietica encuentro ha reunido a investigadores de todo el mundo, repr y del mundo empresarial para conocer de primera mano los resu y su posible aplicación en clientes actuales y futuros. El alcalde María Román; el director general del Agua del Ministerio p, Ecológica, Manuel Menéndez; la representante del proyecto Oficina europea, Szilvia Boszezt; el director de Aqualia en el sur de España, Lucas Díaz; el coordinador del proyecto All-Gas y director de Innovación y Tecnología de Aqualia, Frank Rosalia; y el presidente de la Confederación Hidrográfica del Guadalquivir, Joaquín Pérez han presidido en evento.

El nuevo desarrollo a base de algas consume tres veces menos energía que la empleada en el proceso. Tras conocer el funcionamiento del proyecto



Scientific publications

Year	Magazine	Title	Author	Related projects
2019	Journal of Membrane Science	Volatile fatty acids concentration in real wastewater by forward osmosis	Gaetan Blandin, Bàrbara Rosselló, Victor M. Monsalvo, Pau Batlle-Vilanova, Jose M. Viñas, Frank Rogalla, Joaquim Comas	MIDES
2019	Chemical Engineering Journal	Novel macroporous 3D photocatalytic foams for simultaneous wastewater disinfection and removal of contaminants of emerging concern	Miguel Martín-Sómer, Cristina Pablos, Ana de Diego, Rafael van Grieken, Ángel Encinas, Victor M. Monsalvo, Javier Marugán	MOTREM
2019	Bioresource Technology	Technology validation of photosynthetic biogas upgrading in a semiindustrial scale algal-bacterial photobioreactor	María del Rosario Rodero, Raquel Lebrero, Esteban Serrano, Enrique Lara, Zouhayr Arbib, Pedro A. García-Encina,c, Raúl Muñoz	INCOVER
2019	Chemosphere	Evaluation of transformation products from chemical oxidation of micropollutants in wastewater by photoassisted generation of sulfate radicals	Jorge Rodríguez-Chueca, Carmen Garcia-Cañibano, Marco Sarro, Angel Encinas, Claudio Medana, Debora Fabbri, Paola Calza, Javier Marugán	MOTREM
2019	Environmental Science: Water Research & Technology	An optimised control system to steer the transition from anaerobic mono- to co-digestion in full-scale plants	Anton Taboada-Santos, Marta Carballa, Nicolás Morales, Jose R. Vázquez-Padín, Ramiro Gutierrez and Juan M. Lema	SGG
2019	Waste Management	Nitrite and free nitrous acid sludge pre-treatments to enhance methane production in continuous anaerobic digestion: Comparing process performance and associated costs	Maycoll Romero-Güiza, Soraya Zahedi, Victor Monsalvo, Pilar Icaran, Maite Pijuan	SGG
2019	Renewable and Sustainable Energy Reviews	Co-digestion strategies to enhance microalgae anaerobic digestion: A review	Maria Solé-Bundó, Fabiana Passos, Maycoll S. Romero-Güiza, Ivet Ferrer, Sergi Astals	INCOVER
2019	Journal of Artificial Societies and Social Simulation	Modelling Contingent Technology Adoption in Farming Irrigation Communities	Antoni Perello-Moragues, Pablo Noriega and Manel Poch	VIRTUAL CSIC
2019	Energies	Development of a Modified Plug-Flow Anaerobic Digester for Biogas Production from Animal Manures	Daniel Gómez , Juan Luis Ramos-Suárez, Belén Fernández, Eduard Muñoz, Laura Tey, Maycoll Romero-Güiza and Felipe Hansen	

Brave Blue World: Estreno 16.12. en Hollywood

Not-for-profit platform for scientific educational storytelling and public engagement.



Wastewater as a Resource: Turning wastes into opportunities

6 R's in the Circular Economy

Reduce:

Consumption and cost – **energy**, **water**, **chemicals**
Environmental Impact and Footprint

Reuse:

water and **nutrients**

Recycle:

energy

Recover:

Solids and subproducts

Redesign:

Processes
Infrastructure

Rethink:

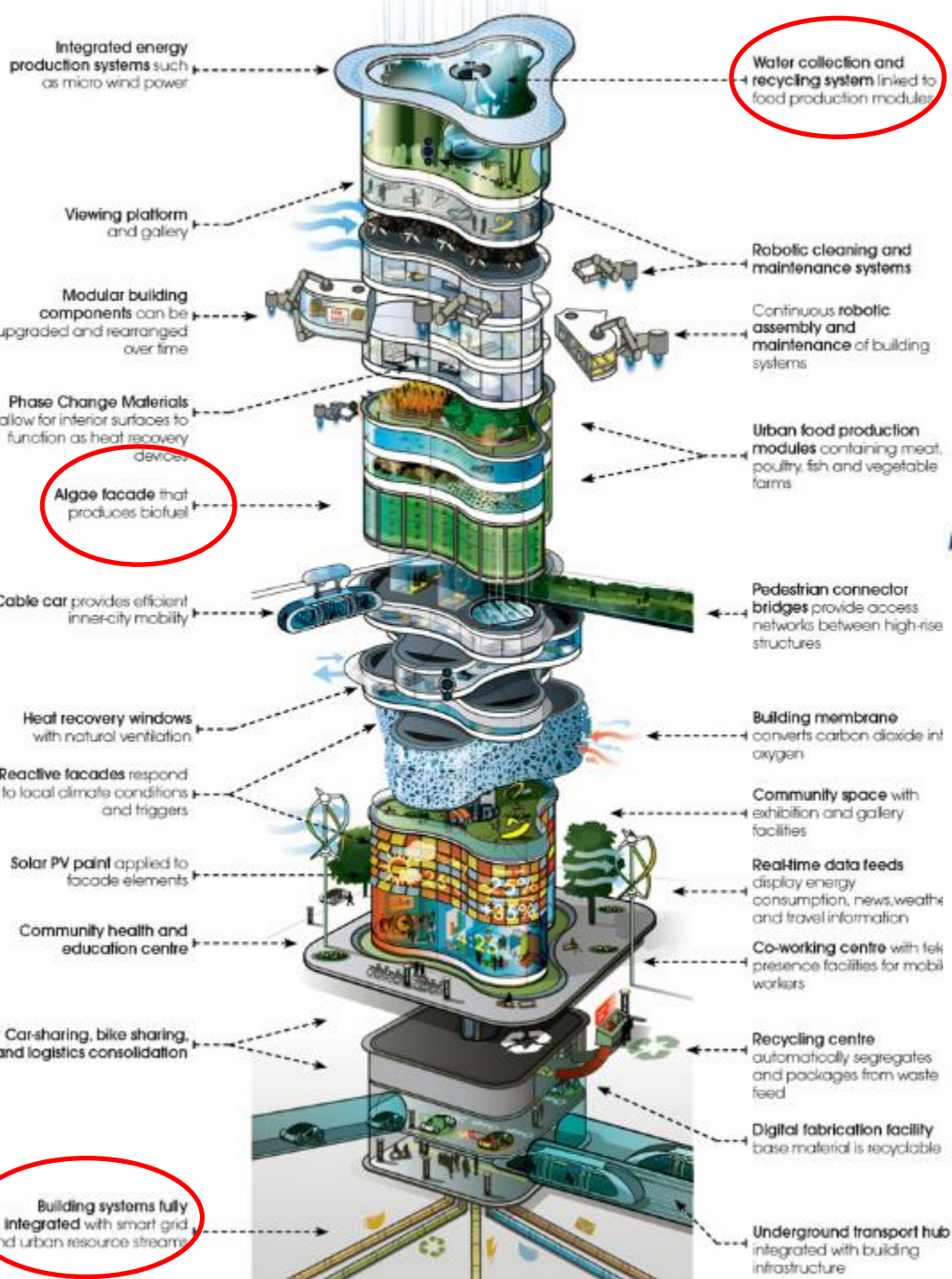
Governance

Plus:

Reinvent and **Revolutionize** –
New Paradigms



THE circular CITY OF THE FUTURE



From the theme: key concepts for a new way of thinking





Thank you !!

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