

PERSONAL INFORMATION **Alessia Amato**[✉ a.amato@univpm.it](mailto:a.amato@univpm.it)QUALIFICATION **PhD, Non-tenured Assistant Professor**

## WORK EXPERIENCE

May 2020-current

**PhD, Non-tenured Assistant Professor**

Department of Life and Environmental Science, Università Politecnica di Marche, Ancona  
ING IND 26 Italian university sector (i.e. Theory for the development of chemical processes)  
Research activity in the field of:

- hydro/biohydrometallurgy
- urban mining
- critical raw materials
- recycling of waste from electric and electronic equipment
- environmental sustainability, life cycle assessment

January 2017-April 2020

**Research fellow**

Department of Life and Environmental Science, Università Politecnica di Marche, Ancona  
ING IND 26 Italian university sector (i.e. Theory for the development of chemical processes)  
Research activity in the field of:

- urban mining
- Critical raw materials
- recycling of waste from electric and electronic equipment
- environmental sustainability, life cycle assessment

January 2018-current

**Professor**

Department of Life and Environmental Science, Università Politecnica di Marche, Ancona  
Subject: Certification and regulations for the environment  
Main topics:

- Life Cycle Assessment, LCA
- Use of Gabi Software
- EMAS and ECOLABEL certification

January 2018-current

**Professor**

Department of Life and Environmental Science, Università Politecnica di Marche, Ancona,  
PhD course Subject: "Environmental sustainability: the life cycle assessment, LCA"

September-November 2018

**Collaboration within the LIFE-BITMAPS research project**

Department of Industrial Engineering and Information and Economics, University of L'Aquila, L'Aquila

Environmental impact analysis (LCA) of processes for the treatment of wastewater from electronic industry

September 2017-current

**Examination board member**

Department of Life and Environmental Science, Università Politecnica of Marche, Ancona

Subjects:

- Environmental remediation techniques
- Statistics for experimental sciences
- Waste management and environmental remediation
- Mathematics

**Evaluator of research projects**

2021-2020

Austrian Science Fund (Austria)- Evaluation of a research project proposal received by the Austrian Science Fund (FWF) within the Lise Meitner Program

2019

FINPIEMONTE - Ex post evaluation of industrial research and experimental development projects.

5, 13, 14/12/2016

**Speaker in a seminar about life cycle assessment**

Department of Life and Environmental Science, Università Politecnica of Marche, Ancona

"Life cycle assessment methodology".

September - October 2016

**Collaborator for the National Scientific Degrees Plan**

Department of Life and Environmental Science, Università Politecnica of Marche, Ancona

Chemistry exercise

July 2015

**Visiting researcher at Technical University of Crete**

Technical University of Crete, Greece

- Experimental activity concerning the improvement of the physical properties of hydroxiapatite material.

December 2014-September  
2015**Chemistry tutor**

Department of Life and Environmental Science, Università Politecnica of Marche, Ancona

**EDUCATION**

November 2013-March 2017

**PhD**

Department of Life and Environmental Science, Università Politecnica of Marche, Ancona

- Title of the thesis: "Innovative and sustainable strategies of urban mining"
- Research activity in the field of recovery of critical raw materials from electric and electronic waste within HydroWEEE Demo (01.10.2012 – 30.09.2016). More in detail, the project (FP7) addressed at

the small and medium enterprise involved with the WEEE treatment. The activity included: the optimization of a process for the recovery of indium from end-of-life liquid crystal displays. The experimental activity was combined with a life cycle assessment to define the environmental load and the weaknesses to improve. The whole process was designed in the perspective of a real scale application within the same European project. The risk assessment on the plant concluded the PhD work.

11 July 2013 **Master degree in: Environmental sustainability and civil protection**

Università Politecnica of Marche, final mark: 110 (magna cum laude), Title: Evaluation of environmental impact of solid biomass domestic heating system

6 October 2011 **Bachelor's degree in Chemistry and technologies for the environment and the materials, CV: environment, energy and waste**

University of Bologna, final mark: 110 (magna cum laude), Title: Optimization of chemical-physical process for the industrial wastewater

2 July 2008 **High school diploma of chemical expert**

TRAINING

October 2018 PROMETIA Tech Tour 2018, organized in Belgium to visit two pilot facilities (Hydrometal and CRM near Liège), UMICORE plant and Leuven University.

October 2017 Training course: "The environmental evaluations: VIA (evaluation of environmental impact) and VAS (strategic environmental evaluation)"

20-25 July 2017 **Summer school "Management of Wastewater"**

Hellenic Open University, Thessaloniki, Greece

- Classes about wastewater treatment

01-04 April 2014 **Software Gabi 6.3 training course (for life cycle assessment)**

PE International, Stoccarda, Germany

- Basic training
- Advanced training

20-26 May 2012 **Leonardo program**

Regione Marche, Ancona

Participation in a mobility program regarding the industrial biotechnology.

MOST RELEVANT RESEARCH PROJECT

2018-2021 H2020 -MSCA-RISE e.THROUGH Thinking rough towards sustainability.

2019-2020 Research agreement in the project LiBat - LIFE16 ENV/IT/000389 Recycling of primary Lithium BATtery by mechanical and hydrometallurgical operations. Task: Environmental sustainability assessment.

2018-2019 LIFE BITMAPS - Pilot technology for aerobic Biodegradation of spent TMAH Photoresist solution in Semiconductor industries LIFE15 ENV/IT/000332. A.A. Task: Environmental sustainability assessment.

- 2018-2019 H2020-NMBP-2016-2017 “Future business models for the Efficient recovery of Natural and Industrial secondary resources in eXtended supply chains contexts – FENIX, task: “Development of biotechnological processes for the extraction of valuable metals from end of life printed circuit boards”
- 2018-2022 PSR MARCHE 2014-2020 Measure 16.1 Action 1 Circular economy in agriculture
- 2016-2017 POR FESR MARCHE 2014-2020 RAEEcovery: Solutions for an efficient and sustainable value chain in the management of electronic waste.
- 2012-2017 FP7-ENV.2012.6.5-2 “HydroWEEE DEMO 308549 - Innovative Hydrometallurgical Processes to recover Metals from WEEE including lamps and batteries – Demonstration”.

## ASSIGNMENTS

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- MAY-JUNE 2021 Assignment by Newster System S.r.l. for the environmental sustainability assessment of strategies of infectious hospital solid waste management (by LCA approach)
- 23/01/2020-31/10/2020 Assignment by consumer association “Cittadinanzattiva of Marche” for the planning of activities in the field of the best practices of circular economy
- 01/09/2018-30/11/2018 ECO Recycling S.r.l. for the support in the environmental sustainability assessment of innovative processes for end-of-life lithium battery recycling.
- 01/09/2018-30/11/2018 Collaboration contract with the Department of Industrial Engineering, Information and Economy for the environmental sustainability assessment (by LCA approach) of process for the treatment of galvanic industrial wastewater.

## ADDITIONAL INFORMATION

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- Publications on International Journal**
- Becci A., Beolchini F., Amato A. Sustainable strategies for the exploitation of end-of-life permanent magnets. Processes. 2021
- Amato A., Becci A., Villen-Guzman M., Vereda-Alonso C., Beolchini F. Challenges for sustainable lithium supply: A critical review. Journal of Cleaner Production. 1 June 2021
- Innocenzi V., Cantarini F., Zueva S., Amato A., Morico B., Beolchini F., Prisciandaro M., Vegliò F. Resources, Conservation and Recycling. Environmental and economic assessment of gasification wastewater treatment by life cycle assessment and life cycle costing approach. May 2021
- Amato A., Mastrovito M., Becci A., Beolchini F. Environmental sustainability analysis of case studies of agriculture residue exploitation. Sustainability. April 2021
- Becci A., Amato A., Rodriguez-Maroto J.M., Beolchini F. Bioleaching of End-of-Life Printed Circuit Boards: Mathematical Modeling and Kinetic Analysis. Industrial and Engineering Chemical Research. March 2021
- Innocenzi, V., Cantarini, F., Amato, A., Morico, B., Ippolito, N.M, Beolchini, F., Prisciandaro, M., Vegliò, F. Case study on technical feasibility of galvanic wastewater treatment plant based on life cycle assessment and costing approach. Journal of Cleaner Production. December 2020. 8 (6), December 2020, 104535.
- Amato A., Bigi G.P., Baldini C., Beolchini F. Sustainable Reduction of the Odor Impact of Painting Wooden Products for Interior Design. Applied Sciences (Switzerland), 2020, 10(22), pp. 1–9, 8124
- Dell'Anno, A., Beolchini F., Corinaldesi C., Amato A., Becci A., Rastelli E., Hekeu M., Regoli F., Astarita e., Greco S., Musco L. Denovaro R. Assessing the efficiency and eco-sustainability of bioremediation strategies for the reclamation of highly contaminated marine sediments. Marine Environmental Research. December 2020, 105101.

Innocenzi V., Cantarini F., Amato A., Morico B., Ippolito N.M., Beolchini F., Prisciandaro M., Vegliò, F. Case study on technical feasibility of galvanic wastewater treatment plant based on life cycle assessment and costing approach. *Journal of Environmental Chemical Engineering*. December 2020. 8 (6), 104535

Beolchini, F., Becci, A., Barone, G., Amato, A., Hekeu, M., Danovaro, R., Dell'Anno, A. High fungal-mediated leaching efficiency of valuable metals from deep-sea polymetallic nodules. *Environmental Technology and Innovation*. November 2020 20:101037

Petranikova, M., Tkaczyk, A.H., Bartl, A., Amato, A., Lapkovskis, V., Tunsu, C. Vanadium sustainability in the context of innovative recycling and sourcing development. *Waste Management (2020)* 113, 521-544

Amato A., Becci A., Beolchini A. Sustainable recovery of Cu, Fe and Zn from end-of-life printed circuit boards. *Resources, Conservation and Recycling (2020)* 158:104792

Amato A., Becci A., Beolchini F. Citric acid bioproduction: the technological innovation change. *Critical review in biotechnology*. 40(2), 199-212

Becci A., Amato A., Fonti V., Karaj D., Beolchini F. An innovative biotechnology for metal recovery from printed circuit boards. *Resources, Conservation and Recycling*. (2020) 153: 104549

Pennesi C., Amato A., Occhialini S., Critchley A. T., Totti C., Giorgini E., Conti C., Beolchini F. Adsorption of indium by waste biomass of brown alga *Ascophyllum nodosum*. *Scientific report (2019)* 9(1), 1-11.

Becci A., Amato A., Rodriguez-Maroto J. M., Beolchini F. Prediction model for the Cu chemical leaching from PCBs. *Industrial & Engineering Chemistry Research*. (2019)

Pagnanelli F., Moscardini E., Altimari P., Padoan F. CSM, Atia T. A., Beolchini F., Amato A., Toro L. Solvent versus thermal treatment for glass recovery from end of life photovoltaic panels: Environmental and economic assessment. *Journal of environmental management*. (2019) 248: 109313

Amato A., Gabrielli F., Spinozzi F., Balducci S., Magi Galluzzi L., Beolchini F. Strategies of disaster waste management after an earthquake: a sustainability assessment *Resources, Conservation & Recycling (2019)* 146:590-597.

Amato A., Becci A., Birloaga I., De Michelis I., Ferella F., Innocenzi V., Ippolito N.M., Pillar Jimenez Gomez C., Vegliò F., Beolchini F. Sustainability analysis of innovative technologies for the rare earth elements recovery. *Renewable and Sustainable Energy Reviews (2019)* 106: 41-53

Amato A., Beolchini F. End-of-life CIGS photovoltaic panel: a source of secondary indium and gallium. *Progress in Photovoltaics: Research and Applications (2019)* 27(3): 229-236.

Amato A., Gabrielli F., Spinozzi F., Balducci S., Magi Galluzzi L., Beolchini F. Disaster waste management after flood events. *Journal of Flood Risk Management*. In press

Amato A., Becci A., Mariani P., Carducci F., Ruello M.L., Monosi S., Giosuè C., Beolchini F., End-of-life liquid crystal display recovery: Toward a zero-waste approach. *Applied Sciences (Switzerland) (2019)* 9(15), 2985

Amato A., Beolchini F. End of life liquid crystal displays recycling: a patent review. *Journal of Environmental Management (2018)* 225: 1-9.

Bartl A., Tkaczyk AH, Amato A., Beolchini F., Lapkovskis V., Petranikova M.. Supply and substitution options for selected critical raw materials: cobalt, niobium, tungsten, yttrium and rare earths elements. *Detritus (2018)* 3: 37-42.

Tkaczyk A. H., Bartl A., Amato A., Lapkovskis V., Petranikova M. Sustainability evaluation of essential critical raw materials: cobalt, niobium, tungsten and rare earth elements. *Journal of*

Physics D: Applied Physics. (2018) 51(20),203001

Rocchetti L., Amato A., Beolchini F. Printed circuit board recycling: A patent review. *Journal of Cleaner Production* (2018) 178: 814-832.

Gabrielli F., Amato A., Balducci S., Magi Galluzzi L., Beolchini F. Disaster waste management in Italy: Analysis of recent case studies. *Waste Management* (2018) 71: 542-555.

Amato A., Rocchetti L., Beolchini F. Evaluation of different strategies for end-of-life liquid crystal displays (LCD) management. *Environmental Engineering and Management Journal* (2017) 16/8: 1651-1657.

Amato A., Rocchetti L., Beolchini F. Environmental impact assessment of different end-of-life LCD management strategies. *Waste Management* (2017) 59: 432-441.

Rocchetti L., Amato A., Beolchini F. Recovery of indium from liquid crystal displays. *Journal of Cleaner Production* (2016) 116: 299-305.

Rocchetti L., Amato A., Fonti V., Ubaldini S., De Michelis I., Vegliò F., Beolchini F. Cross-current leaching to recover indium from end-of-life LCD panels. *Waste Management*. (2015) 42:180-187.

Toscano G., Duca D., Amato A., Pizzi A. Emission from realistic utilization of wood pellet stove. *Energy*. (2014) 68:664-650

#### Editorial activity

Guest Editor: [Sustainability] Special Issue: The Circular Economy Challenge: Towards a Sustainable Development (2020-2021)

#### Technology Transfer

**Patent pending:** Beolchini F., Amato A., Mariani P., Carducci F., Ruello M.L., Monosi S., Metodo di trattamento e valorizzazione di schermi a cristalli liquidi a fine vita con rifiuti zero

#### Publication on Italian Journal

Gabrielli F., Magi Galluzzi L., Amato A., Beolchini F., Balducci S. Rifiuti in emergenza: analisi di recenti casi di studio italiani. *Emergency*

Gabrielli F., Magi Galluzzi L., Amato A., Beolchini F., Balducci S. Gestione dei rifiuti in emergenza: analisi di casi di studio italiani. *Ingegneria dell'ambiente*

#### Chapters in a book

Amato A., F. Beolchini, Birloaga I., De Michelis I., Innocenzi V., Vegliò F. A Successful Case Study of Critical and Rare Earth Elements Recovery from Secondary Resources: The HydroWEEE Technology. Chap. In: Akcil A.A., Critical and Rare Earth Elements. Recovery from Secondary Resources. CRC Press, Taylor and Francis Group. ISBN 9780367086473 - CAT# K406790 2019

Fonti V., Amato A., Beolchini F., Urban biomining: new challenges for a successful exploitation of WEEE by means of a biotechnological approach. In: Abhilash BD, Pandey KA, Natarajan. *Microbiology for Minerals, Metals, Materials and Environment*. CRC Press 2015.

Amato A., Beolchini F., Spent liquid crystal display panel processing by hydrometallurgical Methods. In: Vegliò F., Birloaga I. *Waste Electrical and Electronic Equipment Recycling. Aqueous Recovery Methods*. WP WoodHead Publishing. May 2018.

#### Publication of PhD Thesis

Alessia Amato. Innovative and sustainable strategies of urban mining. *Critical raw materials from WEEE*. Edizioni accademiche italiane. May 2018

#### Conferences

Amato A., Beolchini F. Urban mining: dream or reality? Ecomondo, November 2018

Gabrielli F., Amato A., Balducci S., Magi Galluzzi L., Beolchini F. Life Cycle Assessment approach for the disaster waste management. Ecomondo, November 2018

Becci A., Amato A., Fonti V., Karaj D., Beolchini F. An innovative biotechnological approach for

printed circuit boards recycling. Ecomondo, November 2018

Amato A., Gabrielli F., Balducci S., Magi Galluzzi L., Beolchini F. Environmental impact assessment of different strategies of waste management within Italian emergency scenarios. Sardinia 2017 / Sixteenth International Waste Management and Landfill Symposium, S. Margherita di Pula, 4 October 2017

Amato A., Beolchini F. End-of-life CIGS panel: a potential source of valuable metals, Ecomondo, Rimini, 8 November 2017.

Bartl A., Tkaczyk A., Amato A., Lapkovskis V., Petranikova M. Critical Raw Materials Under Extreme Conditions: A Review of Niobium. Symposium I "Solution for Critical Raw materials Under Extreme Conditions". Cost action, Working Group 4– Value chain impact. September 2017

Amato A., Rocchetti L., Beolchini F. Evaluation of different strategies of end-of-life LCDs management, Ecomondo, Rimini 10 November 2016.

Amato A., Rocchetti L., Fonti V., Ruello M.L., Beolchini F. End-of-life liquid crystal displays as a source of critical raw materials, Burgos 6-7 October 2016.

Amato A., Rocchetti L., Fonti V., Abo Atia T., Altimari P., Moscardini E., Toro L., Pagnanelli F., Beolchini F. Recovery of critical metals from LCDs and Li-Ion batteries. Electronic Goes Green 2016+, Berlino 7-9 September 2016.

Amato A., Rocchetti L., Beolchini F. Strategie di gestione di LCD a fine vita: un caso di studio e applicazione dell'LCA. Congresso Rete italiana LCA, Ravenna 23-24 June 2016.

Amato A., Rocchetti L., Beolchini F. Environmental impact assessment of different end-of-life LCD management strategies. Symposium on Urban mining and Circular economy, Bergamo 23-25 May 2016

Montanari B., Amato A., Monosi S., Beolchini F., Ruello M. L. Valorizing end of life LCD scraps after indium recovery. 2016 Spring Meeting of European Materials Research Society, Lille 2-6 May 2016.

Amato A., Rocchetti L., Fonti V., Ruello M.L., Beolchini F. Secondary indium production from end-of-life liquid crystal displays. 2016 Spring Meeting of European Materials Research Society, Lille 2-6 May 2016.

Rocchetti L., Amato A., Fonti V., Beolchini F. End-of-life liquid crystal displays: a secondary source of indium. Ecomondo, Rimini, 3-6 November 2015

Rocchetti L., Amato A., Fonti V., Beolchini F. Environmentally sustainable strategies for the recovery of a critical raw material from electronic waste. 16th European Meeting on Environmental Chemistry, Torino 30 November- 3 December 2015.

Fonti V., Rocchetti L., Amato A., Beolchini F. Going Beyond the WEEE Directive: Examples of Waste Management Options that create Advantages to the Environment. Ecology at the interface, Rome, 21-25 September 2015

Rocchetti L., Amato A., Fonti V., Beolchini F. Innovative method to extract indium from LCD panels. International Conference of Chemical and Process Engineering, Milano 19-22 May 2015.

Rocchetti L., Amato A., Fonti V., Ubaldini S., De Michelis I., Kopacek B., Vegliò F., Beolchini F. Hydrometallurgical processes for the recovery of precious and critical metals from liquid crystal displays. Conference Going Green – Care Innovation 2014, Vienna, 17-20 November 2014.

#### Reviewer

Scientific Reviewer for Waste Management, Chemical Engineering Transactions Journal Reviewer for the international journals: Powder Technology, Resources conservation and recycling, Minerals, Metals, Journal of Cleaner Production, Progress in Photovoltaics, RSC Advances,

	Journal of Environmental Management, Journal of water process engineering, Sustainability.
Thesis supervisor	<p>“Circular agriculture: environmental sustainability analysis of organic residues' valorization processes”</p> <p>“DIET AND ENVIRONMENT: DO YOU EAT SUSTAINABLE?”</p>
Thesis correlator	<p>“Marine biological materials as innovative metal sorbents”</p> <p>“Innovative strategies for valuable metals extraction from electronic waste: experimental activity and environmental sustainability assessment”</p> <p>“Sustainable strategies for valuable metals extraction from end- of-life photovoltaic panel and electronic waste”</p> <p>“Low environmental innovative technologies for the indium and gallium extraction from electronic waste”</p> <p>“Innovative biotechnological strategies for metals recovery from electronic waste”</p>
Scientific dissemination	Scientific dissemination activity within Sharper: the night of researchers
Honors and awards	<p>Rotary award, Ancona 2014</p> <p>Academic award, Rimini 2010</p>
European framework participation	COST, CRM-Extreme (Critical Raw Materials Extreme), Working group 4- Value chain impact

, 23<sup>rd</sup> November 2021