# Literature Review: Strategic Network Optimization Models in Waste Reverse Supply Chains - Online Appendix

Jens Van Engeland[*1a], Jeroen Beliën[b], Liesje De Boeck[b], Simon De Jaeger[a]

[a] *KU Leuven, Center for Economics and Corporate Sustainability, Faculty of Economics and Business, Campus Brussels, Warmoesberg 26, BE-1000 Brussels, Belgium*

[b] *KU Leuven, Research Center for Quantitative Business Processes, Faculty of Economics and Business, Campus Brussels, Warmoesberg 26, BE-1000 Brussels, Belgium*

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[*]corresponding author, address: Warmoesberg 26, BE-1000 Brussels.

*Email addresses:* jens.vanengeland@kuleuven.be (Jens Van Engeland[*1]), jeroen.belien@kuleuven.be (Jeroen Beliën), liesje.deboeck@kuleuven.be (Liesje De Boeck), simon.dejaeger@kuleuven.be (Simon De Jaeger)

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Table A.1: Network type of reviewed papers. Reuse and repair refer generally to the final product level. Refurbished products or parts needed clean up, a new layer of paint and/or reparation. The remanufacturing process might provide a product with new parts. Recovery at the materials level is classified as recycling. Treatment indicates whether the stream of products is subjected to a procedure before final disposal, for example thermal treatment. Some models do only model part of a network, or do not specify the recovery option. These models are classified as "not specified/general".

| | recovery option | 1995-1998 | 1999-2002 | 2003-2006 | 2007-2009 | 2010-2012 | 2013-2015 | 2016-2017 |
|---|---|---|---|---|---|---|---|---|
| open loop | reuse | | | | [71] | | [201], [67] | [104], [214] |
| | repair | | | | [71] | | [213] | [104], [215], [76] |
| | refurbish | | | | [71] | | [230], [208] | [215] |
| | remanufacture | | [280] | | | [163], [83], [79] | [238], [230], [213] | [86], [222], [104], [215], [243], [127], [76], [105] |
| | recycling | [174], [88] | [188], [189] | [89], [259] | [156], [281], [94], [71] | [129], [282], [163], [138], [122], [83], [178], [79], [112] | [283], [236], [201], [101], [135], [258], [245], [113], [238], [213], [165], [98], [118], [130], [199], [255], [208], [114], [160], [95] | [86], [103], [104], [214], [284], [151], [127], [285], [76], [260], [207], [187] |
| | (thermal) treatment | [174] | | | [99] | [129], [100], | [101], [102], [114] | [103], [104], [284], [149], [286], [127], [285] |
| | final disposal | [174] | [287] | [195] | [196] | [129], [100], [83], [288], [79], [289] | [283], [201], [101], [113], [213], [130], [199], [208], [114], [160], [119] | [86], [103], [222], [104], [214], [284], [149], [286], [215], [285], [76], [207], [290], [263] |
| | not specified/general | | | | [246], [233] | [139], [289] | [235], [191], [291], [237], [231], [171] | [248], [180], [126], [134], [181] |
| closed loop | reuse | | | | | | [64], [65], [66], [292] | [261], [293], [69], [68] |
| | repair | | | [70] | | [294] | [183], [202], [266], [143] | [261], [72], [73], [240], [148], [74], [75], [192], [186], [153] |
| | refurbish | | | | | | [197], [159], [228], [212], [184], [202], [65], [77], [172], [173] | [145], [78], [69], [75], [192] |
| | remanufacture | | | [70], [136] | [108] | [15], [190], [234], [203], [295], [294], [168], [84], [223], [158], [242] | [197], [169], [227], [159], [228], [212], [182], [183], [184], [64], [221], [65], [266], [226], [77], [142], [143], [85], [81], [87], [166], [239], [91], [131], [224], [144] | [194], [124], [145], [209], [146], [78], [211], [161], [125], [204], [193], [154], [216], [73], [210], [162], [262], [148], [120], [296], [82], [297], [298], [167], [219], [217], [220], [241], [186], [128], [153] |
| | recycling | | | [70] | [93] | [157], [225], [190], [294], [155], [97], [200] | [140], [212], [183], [244], [205], [64], [202], [266], [229], [143], [85], [170], [87], [123], [90], [92], [179] | [145], [147], [78], [161], [73], [240], [148], [74], [69], [132], [150], [133], [121], [219], [192], [217], [152], [299], [300], [186] |
| | (thermal) treatment | [106] | | | | | | |
| | final disposal | | | [70] | [93] | [157], [225], [15] , [203], [294], [84], [223], [200], [158] | [197], [169], [227], [140], [159], [228], [182], [183], [244], [184], [64], [221], [202], [65], [266], [229], [77], [142], [143], [85], [170], [81], [185], [87], [66], [206], [123], [172], [173], [232], [239], [131], [224], [247] | [124], [145], [146], [78], [211], [161], [204], [193], [154], [216], [73], [210], [162], [148], [74], [69], [75], [133], [121], [219], [192], [68], [152], [153] |
| | not specified/general | | | | [109] | | [164], [301], [141], [185], [206], [123], [232], [247] | [249] |

Table A.2: Overview of models with a single objective. NIMBY = Not In My BackYard, characterizing opposition of affected residents. The "min. cost / max. revenue" objective represents cost (revenue) in general terms: total cost, total discounted cost, cost per product returned, etc.

| | reference | min. cost | max. revenue | max. customer coverage | min. (walking) distance for end consumers | min. driving distance | max. products collected | min. NIMBY sentiments | min. carbon emissions |
|---|---|---|---|---|---|---|---|---|---|
| single | [174], [88], [287], [280], [89], [136], [218], [108], [246], [156], [281], [99], [157], [234], [163], [100], [138], [122], [203], [295], [288], [79], [168], [289], [84], [155], [200], [242], [164], [235], [140], [283], [236], [159], [291], [201], [244], [258], [231], [245], [141], [221], [65], [226], [77], [238], [230], [171], [165], [98], [143], [85], [130], [255], [170], [81], [185], [206], [123], [160], [292], [131], [247], [95] [86], [261], [146], [211], [204], [249], [154], [216], [222], [248], [73], [162], [262], [286], [297], [298], [150], [68], [285], [152], [76], [260], [207], [128], [181], [187], [153] | ✓ | | | | | | | |
| | [259], [109], [71], [93], [225], [294], [139], [223], [302], [158], [227], [183], [202], [266], [213], [118], [199], [208], [114], [66], [166], [239], [161], [125], [249], [293], [240], [148], [296], [167], [133], [219], [220], [300], [105] | | ✓ | | | | | | |
| | [233] | | | ✓ | | | | | |
| | [282] | | | | ✓ | | | | |
| | [178] | | | | | | ✓ | | |
| | [283] | | | | | ✓ | | | |
| | [237] | | | | | | | ✓ | |
| | [85] | | | | | | | | ✓ |
| | [290] | | | ✓ | | | | | |

Table A.3: Overview of multi-objective models. A no preference methods does not use information from a Decision Maker (DM), and a single optimal solution is given. In a priori methods, a DM has to give some preferences before the model is solved. An a posteriori method presents the entire range of efficient solutions. GP = Goal Programming, EA = Evolutionary Algorithm; WT = Weighted Tchebycheff method.

| | method basis | reference | year | min. cost | max. revenue | max. population serviced / customer coverage | max. network responsiveness / products collected / recycled | min. waste / min. landfill space / max. volume reduction | max. product quality / min. defect rates | min. risk related to population exposure | min. tardiness / max. on time deliv. | min. political opposition / pop. affected / obnoxious effects | min. GHG / $CO_2$ emissions or cost / max. emission savings | min. energy use / max. energy recovery | max. environ. benefits / min. environ. impact | min. social impact / max. social benefit | min. financial / economic risk | other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| no preference | min. distance parameter | [87] | 2015 | ✓ | | | | | | | ✓ | | | | | | | |
| a priori | fuzzy | [189] | 2000 | | | ✓ | | | | | | | | | | | | ✓ |
| | | [190] | 2010 | ✓ | | | | | | | ✓ | | | | | | | |
| | | [97] | 2012 | ✓ | | | | | | | | | | | | | | ✓ |
| | | [228] | 2013 | ✓ | | | | | | | | | | | | | | ✓ |
| | | [212] | 2013 | | ✓ | | | | | | | | | | | | | ✓ |
| | | [205] | 2013 | ✓ | | | | | | | | | | | | | | ✓ |
| | | [184] | 2014 | ✓ | | | | | | | | | | | | | | ✓ |
| | | [102] | 2014 | ✓ | | | | ✓ | | | | ✓ | | | | | | |
| | | [144] | 2015 | | ✓ | | | | | | ✓ | | | | | | | ✓ |
| | | [145] | 2016 | ✓ | | | | ✓ | | | | ✓ | | | | ✓ | | |
| | | [209] | 2016 | ✓ | | | | | | | | | | | | ✓ | | |
| | | [180] | 2016 | ✓ | | | | | | | | | | ✓ | ✓ | | | |
| | | [215] | 2017 | | ✓ | | | ✓ | | | | | | | | | | |
| | | [126] | 2017 | ✓ | | | | | | | | | | | | | | ✓ |
| | | [127] | 2017 | ✓ | | | | | | | | | | ✓ | ✓ | | | |
| | | [186] | 2017 | | ✓ | ✓ | | | | | | | | | | | | ✓ |
| | GP | [94] | 2008 | ✓ | | | | ✓ | | | | | | ✓ | | | | |
| | fuzzy GP | [179] | 2015 | ✓ | | ✓ | | | | | | | | | | | | ✓ |
| | lexicographic | [80] | 2014 | ✓ | | | | | | | | | | | | | | ✓ |
| | predetermined weights | [301] | 2013 | ✓ | | | | | | | ✓ | | | | | | | |
| | | [135] | 2013 | ✓ | | | | | | | | | | ✓ | ✓ | | | |
| | | [149] | 2017 | ✓ | | | | | ✓ | | ✓ | | | | | | | |
| | | [132] | 2017 | ✓ | ✓ | | ✓ | | | | | | | | | | | |
| a posteriori | EA | [188] | 1999 | | | ✓ | | | | | | | | | | | | ✓ |
| | | [196] | 2009 | ✓ | | | | | | | ✓ | | | | | | | |
| | | [15] | 2010 | ✓ | | | ✓ | | | | | | | | | | | |
| | | [64] | 2014 | ✓ | | | | | | | | | | ✓ | ✓ | | | |
| | | [67] | 2015 | ✓ | | | | | | | ✓ | | | | | | | |
| | | [224] | 2015 | ✓ | ✓ | | | | | | ✓ | | | | | | | |
| | | [243] | 2017 | ✓ | | | ✓ | | | | | | | | | | | |
| | weighted sum | [195] | 2004 | ✓ | | | | | | | ✓ | | | | | | | |
| | | [129] | 2010 | ✓ | | | | | | | ✓ | | | | | | | |
| | | [83] | 2011 | ✓ | | | | | | | | | | | | | | ✓ |
| | | [191] | 2013 | ✓ | | | | ✓ | | | ✓ | | | | | | | |
| | | [113] | 2014 | ✓ | | | | | | | | | | ✓ | ✓ | | | |
| | | [147] | 2016 | ✓ | | | | | | | | | | ✓ | | | | |
| | | [193] | 2016 | ✓ | | | | | | | | | | ✓ | | | | |
| | | [104] | 2016 | ✓ | | | | | | | | ✓ | | | | | | |
| | | [74] | 2016 | ✓ | ✓ | | | | | | | ✓ | | | | | | |
| | | [121] | 2017 | | ✓ | | | | | | | ✓ | | | ✓ | | | |
| | | [217] | 2017 | ✓ | | | | | | | | | | ✓ | | | | |
| | | [263] | 2017 | ✓ | | | | | | | | | | | | ✓ | | |
| | $\epsilon$-constraint | [112] | 2012 | ✓ | | | | | | | | | | ✓ | | | | |
| | | [182] | 2013 | | ✓ | | ✓ | | ✓ | | | | | | | | | |
| | | [142] | 2014 | | ✓ | | | | ✓ | | ✓ | | | | | | | |
| | | [90] | 2015 | | ✓ | | | | | | | | | ✓ | ✓ | | | |
| | | [232] | 2015 | | ✓ | | | | | | | | | | | | | ✓ |
| | | [194] | 2016 | ✓ | | | | | | | | ✓ | | | | | | |
| | | [124] | 2016 | | ✓ | | | | | | | | | | | ✓ | | |
| | | [210] | 2016 | ✓ | | | | | | | | ✓ | | | | | | |
| | | [106] | 2017 | ✓ | | | | | | | | ✓ | | | | | | |
| | | [151] | 2017 | ✓ | | | | | | | | | | ✓ | | | | ✓ |
| | | [75] | 2017 | ✓ | | | | | | | ✓ | | | | | | | |
| | | [192] | 2017 | | ✓ | | | | | | | | | ✓ | | | | |
| | | [299] | 2017 | | ✓ | | | | ✓ | | | | | | | | | |
| | | [134] | 2017 | ✓ | | ✓ | | | | | | | | | | | | |
| | lexicogr. WT | [101] | 2013 | ✓ | | | | | ✓ | | | | | | | | | |
| | weighted goal progr. | [70] | 2003 | ✓ | | | ✓ | | | | | ✓ | | | | | | |
| | | [119] | 2015 | ✓ | | | | | ✓ | | | | | | | | | |
| | fuzzy GP | [172] | 2015 | | ✓ | | | ✓ | | | ✓ | | | | | ✓ | | |
| | game theory approach | [120] | 2016 | ✓ | | | | | | | | | | ✓ | | | | |
| interactive | interactive / weighted sum | [229] | 2014 | ✓ | | | | | | | ✓ | | | | | | | |
| | interactive fuzzy GP | [91] | 2015 | | ✓ | | | | | | | | | ✓ | | | | |
| | interactive | [78] | 2016 | | ✓ | | | | | | | ✓ | | | ✓ | | | |
| other | not specified | [96] | 2012 | | ✓ | | | | | | | ✓ | | | | | | |
| | weighted sum + comprom. | [197] | 2013 | | ✓ | | | ✓ | | | ✓ | | | | | | | ✓ |
| | weighted sum + $\epsilon$-constr. | [169] | 2013 | ✓ | | | | | | | | | | ✓ | | | | |
| | non-preemptive and fuzzy GP + compromise progr. | [173] | 2015 | | ✓ | | | ✓ | | | ✓ | | | | | ✓ | | |
| | separately | [92] | 2015 | ✓ | | ✓ | | | | | | | | | | | | |
| | EA + $\epsilon$-constr. | [103] | 2016 | ✓ | | | | | | | | | | ✓ | ✓ | | | |
| | EA + $\epsilon$-constr. | [72] | 2016 | ✓ | | | | | | | ✓ | | | | | | | |
| | weighted sum + $\epsilon$-constr. + WT | [284] | 2016 | ✓ | | | | | ✓ | | | | | | | | | |
| | weighted sum + $\epsilon$-constr. | [82] | 2017 | | ✓ | | | | | | ✓ | | | | | | | |
| | EA + compromise meth. | [69] | 2017 | ✓ | | | | | | | | ✓ | | | | | | |
| | EA + weighted sum | [241] | 2017 | ✓ | | | ✓ | | | | | ✓ | | | | | | |

Table A.4: Applications of models. The third column indicates the WM or RL focus of the paper. Column four represents the studied waste type in each paper. The geographic location is given in column five. The last column indicates whether a fictional illustrative example is included. Some papers present both a case study and a fictional example. Often, it is the case that models are generic, even if they are applied to a specific waste stream. MSW = Municipal Solid Waste, ELV = End-of-Life Vehicle, LPG = Liquefied Natural Gas, WEEE = Waste of Electrical and Electronic Equipment, C&D = Construction and Demolition waste.

| article | year | context | waste type | application description |
|---|---|---|---|---|
| Chang and Wang [174] | 1995 | WM | MSW | site selection in Kaohsiung City, Taiwan |
| Barros et al. [88] | 1998 | RL | sand | location model for sand recycling in The Netherlands |
| Antunes [287] | 1999 | WM | MSW | site selection in Centro Region, Portugal |
| Chang and Wei [188] | 1999 | WM | Recyclables | recycling drop-off stations and collection in Kaohsiung City, Taiwan |
| Krikke et al. [280] | 1999 | RL | copiers | copier remanufacuring in The Netherlands and Czech Republic |
| Chang and Wei [189] | 2000 | WM | MSW | site selection in Kaohsiung City, Taiwan |
| Krikke et al. [70] | 2003 | RL | refrigerators | closed-loop supply chain for refridgerators in Europe |
| Schultmann et al. [89] | 2003 | RL | batteries | battery recycling in Germany |
| Beamon and Fernandes [136] | 2004 | RL | generic | illustrative example |
| le Blanc et al. [259] | 2004 | RL | LPG tanks | recycling system for LB tanks in The Netherlands |
| Rakas et al. [195] | 2004 | WM | hazardous waste | locating undesirable facilities in Prince George's County, Maryland US |
| Hong et al. [218] | 2006 | RL | WEEE | planning e-scrap reverse production system in State of Georgia, US |
| Gomes Salema et al. [108] | 2007 | RL | office products | design of reverse logistic network for office products in Spain and Portugal |
| Lieckens and Vandaele [109] | 2007 | RL | generic | illustrative examples |
| Sahyouni and Savaskan [246] | 2007 | RL | generic | facility location study on cities in US and Europe |
| de Figueiredo and Mayerle [156] | 2008 | RL/WM | tires | design of tire recycling network in Paraná & Santa Catarina Region, Brazil |
| Mansour and Zarei [281] | 2008 | RL | ELV | illustrative examples on ELV recovery |
| Pati et al. [94] | 2008 | RL/WM | paper | paper recycling in India |
| Srivastava [71] | 2008 | RL | generic | modular product recovery in India |
| Gomes Salema et al. [93] | 2009 | RL | generic | strategic and tactical ND in Spain and Portugal |
| Lee and Chan [233] | 2009 | RL | printers/copiers | example on printer/copier recovery |
| Medaglia et al. [196] | 2009 | WM | hospital waste | disposal of hospital waste in Boyac Region, Colombia |
| Mitropoulos et al. [99] | 2009 | WM | MSW | location analysis for MSW treatment and disposal in Achaia Region, Greece |
| Fonseca et al. [129] | 2010 | RL | MSW + recyclables | location model for MSW and recyclable management in Cordoba Region, Spain |
| Gomes Salema et al. [157] | 2010 | RL | glass | design and planning of glass recycling in Portugal + illustrative examples |
| Kao et al. [282] | 2010 | WM | recyclables | location-allocation model in Hsinchu City, Taiwan |
| Kara and Onut [225] | 2010 | RL | paper | paper recycling reverse logistic network design in Istanbul City, Turkey |
| Pishvaee et al. [15] | 2010 | RL | generic | four test instances |
| Pishvaee and Torabi [190] | 2010 | RL | generic | several numerical experiments |
| Wang and Hsu [234] | 2010 | RL | generic | illustrative examples |
| Zarei et al. [163] | 2010 | RL | ELV | illustrative examples |
| Dai et al. [100] | 2011 | WM | MSW | MSW management in Beijing City, China |
| Gomes et al. [138] | 2011 | WM | WEEE | WEEE recycling network in Portugal |
| Mar-Ortiz et al. [122] | 2011 | RL | WEEE | WEEE recycling ND in Galicia Region, Spain |
| Pishvaee et al. [203] | 2011 | RL | generic | four test problems |
| Tuzkaya et al. [83] | 2011 | RL | white goods | strategic ND application for white goods in Turkey |
| Vidovic et al. [178] | 2011 | RL | ELV | positioning ELV collection points in Belgrade City, Serbia |
| Abdallah et al. [295] | 2012 | RL | generic | illustrative examples |
| Amin and Zhang [294] | 2012 | RL | computers | illustrative examples |
| Assavapokee and Wongthatsanekorn [139] | 2012 | RL | WEEE | reverse production infrastructure design in State of Texas, US |
| Chaabane et al. [96] | 2012 | RL | aluminium | illustrative examples |
| Chatzouridis and Komilis [288] | 2012 | WM | MSW | locating MSW transfer stations in East. Macedonia & Thrace Region, Greece |
| Dat et al. [79] | 2012 | RL | WEEE | illustrative examples |
| Hasani et al. [168] | 2012 | RL | food, high-tech electro | illustrative examples |
| Kannan et al. [289] | 2012 | RL | plastic | reverse logistics design for plastic in India |
| Lee and Lee [84] | 2012 | RL | bottles | forward and reverse logistics for bottles in Busan City, South Korea |
| Lieckens and Vandaele [223] | 2012 | RL | printers | example for printer recovery in US |
| zkr and Baslgl [302] | 2012 | RL | generic | illustrative examples |
| Pishvaee and Razmi [112] | 2012 | RL | medical waste | SC ND for used needles in Iran |
| Vahdani et al. [155] | 2012 | RL | steel scrap | illustrative examples |
| Vahdani et al. [97] | 2012 | RL | steel scrap | illustrative examples |
| Xu and Wei [200] | 2012 | WM | C&D waste | location-allocation of C&D waste in China |
| Zeballos et al. [158] | 2012 | RL | glass | glass collection in Portugal |
| Zhou et al. [242] | 2012 | RL | generic | illustrative examples |
| Amin and Zhang [197] | 2013 | RL | computers | illustrative examples |
| Amin and Zhang [169] | 2013 | RL | copiers | illustrative examples |
| Cardoso et al. [227] | 2013 | RL | generic | design and planning of SC in Europe |
| De Rosa et al. [164] | 2013 | RL | generic | illustrative examples |
| Diabat et al. [235] | 2013 | RL | computers | illustrative examples |
| Eskandarpour et al. [191] | 2013 | RL | WEEE | post-sales ND for electronic waste repair in Iran |
| Fahimnia et al. [140] | 2013 | RL | textile | textile recovery and impact of carbon pricing in Australia |
| Galan et al. [283] | 2013 | WM | C&D waste | facility location in Cantabria Region, Spain |
| Golebiewski et al. [236] | 2013 | RL | ELV | location of vehicle recyling facilities in Mazovia Region, Poland |
| Lee et al. [301] | 2013 | RL | generic | illustrative examples |
| zceylan and Paksoy [228] | 2013 | RL | generic | illustrative examples |
| zceylan and Paksoy [159] | 2013 | RL | generic | illustrative examples |
| zceylan and Paksoy [291] | 2013 | RL | generic | illustrative examples |
| zkr and Baslgl [212] | 2013 | RL | generic | illustrative examples |
| Phuc et al. [201] | 2013 | RL | WEEE | illustrative examples |
| Ramezani et al. [182] | 2013 | RL | generic | illustrative examples |
| Ramezani et al. [183] | 2013 | RL | generic | illustrative examples |
| Samanlioglu [101] | 2013 | WM | hazardous waste | location-routing of industrial hazardous waste in Marmara Region, Turkey |
| Shokohyar and Mansour [135] | 2013 | RL | WEEE | WEEE recycling in Iran |
| Song et al. [237] | 2013 | WM | generic | illustrative examples |
| Subramanian et al. [244] | 2013 | RL | WEEE | closed loop ND in India, illustrative examples |
| Vahdani et al. [205] | 2013 | RL | steel scrap | illustrative examples |
| Yao et al. [258] | 2013 | WM | WEEE | design and optimization of WEEE collection in Shanghai City, China |
| Alumur and Tari [80] | 2014 | RL | WEEE | collection center location in Ankara City, Turkey |
| Berglund and Kwon [231] | 2014 | WM | hazardous waste | facility location in Albany Aera, US + Joaquin County CA, US |
| Chen et al. [245] | 2014 | WM | plastics | waste plastic recycling in Tokyo Region, Japan |
| Demirel et al. [184] | 2014 | RL | generic | illustrative examples |
| Devika et al. [64] | 2014 | RL | glass | glass recovery in Iran |
| Faccio et al. [141] | 2014 | RL | electric motors | reprocessing of electric motors in Northern Italy |
| Hatefi and Jolai [221] | 2014 | RL | generic | illustrative examples |

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| article | year | context | waste type | application description |
|---|---|---|---|---|
| Jindal and Sangwan [202] | 2014 | RL | generic | illustrative examples |
| Kaya et al. [65] | 2014 | RL | generic | illustrative examples |
| Kumar et al. [266] | 2014 | RL | generic | illustrative examples |
| Litvinchev et al. [226] | 2014 | RL | generic | illustrative examples |
| Mirakhorli [229] | 2014 | RL | bread | closed loop ND for bread industry in Iran |
| Ng et al. [102] | 2014 | WM | MSW | waste-to-energy network synthesis in Selangor Region, Malaysia |
| zceylan et al. [77] | 2014 | RL | WEEE | illustrative examples |
| Pishvaee et al. [113] | 2014 | RL | medical waste | medical needle and syringe supply chain in Iran |
| Ramezani et al. [142] | 2014 | RL | generic | illustrative examples |
| Roghanian and Pazhoheshfar [238] | 2014 | RL | generic | illustrative examples |
| Sadjadi et al. [230] | 2014 | RL | generic | illustrative examples |
| Sheriff et al. [171] | 2014 | RL | plastic bottles | location routing in India, illustrative examples |
| Soleimani and Govindan [213] | 2014 | RL | generic | illustrative examples |
| Toso and Alem [165] | 2014 | WM | recyclables | location for sorting recyclables in Sorocaba Region, Brazil |
| Vahdani and Naderi-Beni [98] | 2014 | RL | steel scrap | illustrative examples |
| Zeballos et al. [143] | 2014 | RL | generic | illustrative examples |
| Accorsi et al. [85] | 2015 | RL | furniture | furniture recovery network in Italy |
| Aras et al. [118] | 2015 | RL | WEEE | locating recycling facility for electronic waste in Turkey |
| Asefi et al. [130] | 2015 | WM | MSW | location-routing with transfer stations in New South Wales Region, Australia |
| Ayvaz et al. [199] | 2015 | RL | WEEE | network design for WEEE in Turkey |
| Bing et al. [255] | 2015 | RL | plastic | global SC design under emission trading scheme in The Netherlands - China |
| Chen et al. [170] | 2015 | RL | toner cartridges | location-allocation and recycling decisions in Hong Kong |
| Chen et al. [81] | 2015 | RL | WEEE | supply chain design for refrigerators in Germany |
| Choudhary et al. [185] | 2015 | RL | generic | illustrative examples |
| Dubey et al. [87] | 2015 | RL | air conditioners | network design in Uttar Pradesh Region, India |
| Ene and ztrk [208] | 2015 | RL | ELV | network modelling examples and case study |
| Ferri et al. [114] | 2015 | RL/WM | MSW | reverse logistic ND in São Mateus City, Brazil |
| Hasani et al. [66] | 2015 | RL | medical devices | ND for medical devices in Teheran City, Iran |
| Hatefi et al. [206] | 2015 | RL | generic | illustrative examples |
| Kalaitzidou et al. [123] | 2015 | RL | generic | CLSC design case study for company in Europe |
| Kilic et al. [160] | 2015 | RL | WEEE | RL system design for WEEE in Turkey |
| Lee et al. [67] | 2015 | RL | bottles | reuse of bottles in Busan City, South Korea |
| Moghaddam [172] | 2015 | RL | generic | illustrative examples |
| Moghaddam [173] | 2015 | RL | generic | illustrative examples |
| Mota et al. [90] | 2015 | RL | batteries | design of battery recycling SC in Portugal |
| Ponce-Cueto and Molenat Muelas [292] | 2015 | RL | fridges | reuse network for fridges in Spain |
| Ramezani et al. [232] | 2015 | RL | generic | illustrative examples |
| Rezapour et al. [166] | 2015 | RL | automotive parts | realistic example for automotive part remanufacturing in Middle-East |
| Soleimani and Kannan [239] | 2015 | RL | hospital furniture | illustrative examples |
| Subulan et al. [92] | 2015 | RL | lead/acid batteries | ND for lead/acid battery recycling in Turkey |
| Subulan et al. [91] | 2015 | RL | tires | design of CLSC for tires in Aegean Region, Turkey |
| Subulan et al. [179] | 2015 | RL | lead/acid batteries | ND for lead/acid battery recycling in Turkey |
| Tokhmehchi et al. [131] | 2015 | RL | generic | illustrative examples |
| Vahdani and Mohammadi [224] | 2015 | RL | generic | illustrative examples |
| Vahdani [144] | 2015 | RL | steel scrap | illustrative examples |
| Vieira et al. [247] | 2015 | RL | generic | illustrative examples |
| Zhao and Verter [119] | 2015 | WM | used oil | location-routing for used oil in Chongquing Region, China |
| Zhou and Zhou [95] | 2015 | RL | paper | ND for office paper recycling in Xueyuang Road Aera, Beijing City, China |
| Ameknassi et al. [194] | 2016 | RL | generic | case study of microwave oven remanufacturing in North America and Europe |
| Cardoso et al. [124] | 2016 | RL | generic | CLSC ND study in Europe |
| Dai [145] | 2016 | RL | generic | illustrative example |
| Dai and Dai [209] | 2016 | RL | generic | illustrative example |
| Demirel et al. [86] | 2016 | RL | ELV | reverse logistics for ELV in Ankara City, Turkey |
| Deng et al. [261] | 2016 | RL | generic | illustrative example |
| Djikanovic and Vujosevic [146] | 2016 | RL | electronics | logistic model for electronics in Serbia and Europe |
| Entezaminia et al. [147] | 2016 | RL | wood and paper | production and recycling planning for wood and paper industry in Iran |
| Govindan et al. [78] | 2016 | RL | geysers | example on geyser recovery in India |
| Govindan et al. [103] | 2016 | RL | syringes | reverse ND for syringe industry in Iran |
| Hatefi et al. [211] | 2016 | RL | generic | illustrative example |
| Jeihoonian et al. [161] | 2016 | RL | durable products | illustrative example |
| Keyvanshokooh et al. [125] | 2016 | RL | generic | illustrative example |
| Kisomi et al. [204] | 2016 | RL | generic | illustrative example |
| Li et al. [72] | 2016 | RL | electronics | illustrative example |
| Ma et al. [193] | 2016 | RL | generic | illustrative example |
| Mirmajlesi and Shafaei [249] | 2016 | RL | short lifetime products | illustrative example |
| Mohajeri and Fallah [154] | 2016 | RL | notebooks | ND for notebook remanufacturing in Iran |
| Ozceylan [216] | 2016 | RL | camera | example on camera remanufacturing ND |
| Qiang and Zhou [222] | 2016 | RL | generic | example on WEEE remanufacturing |
| Rahmani [293] | 2016 | RL | generic | examples on facility location |
| Saranwong and Likasiri [248] | 2016 | RL | farm products/waste | product distribution of farm waste in Northern Thailand |
| Soleimani et al. [73] | 2016 | RL | plastic bottles | bottle recovery in India, illustrative examples |
| Talaei et al. [210] | 2016 | RL | copiers | illustrative example |
| Wang et al. [240] | 2016 | RL | generic | illustrative example |
| Wu and Barnes [180] | 2016 | RL | WEEE | WEEE recovery ND in China |
| Yi et al. [162] | 2016 | RL | construction machinery | ND for end-of-life construction machinery in China |
| Yu and Solvang [104] | 2016 | RL | general | illustrative example |
| Yu and Solvang [214] | 2016 | RL | WEEE | illustrative example |
| Yuchi et al. [262] | 2016 | RL | generic | illustrative example |
| Zeballos et al. [148] | 2016 | RL | generic | illustrative example |
| Zhalechian et al. [120] | 2016 | RL | LCD and LED TVs | TV remanufacturing in Iran, illustrative example |
| Zhao et al. [284] | 2016 | WM | hazardous waste | ND for hazardous WM in Sichuan Province, China + illustrative example |
| Zohal and Soleimani [74] | 2016 | RL | gold | CLSC ND for gold industry in Iran |
| Amin et al. [296] | 2017 | RL | tires | tire CLSC network in Ontario Region, Canada |
| Amin and Baki [82] | 2017 | RL | generic | facility location in WEEE network in Southwestern Ontario, Canada |
| Asgari et al. [149] | 2017 | WM | obnoxious waste | location-routing for hazardous materials in Singapore |
| Banasik et al. [106] | 2017 | RL | organic substrate/compost | example on industrial mushroom SC |
| Budak and Ustundag [286] | 2017 | RL | medical waste | collection and disposal for medical waste in Turkey |
| Chen et al. [69] | 2017 | RL | photovoltaic panels | illustrative example |
| Coelho and Mateus [297] | 2017 | RL | generic | illustrative example |
| Cui et al. [298] | 2017 | RL | generic | remanufacturing example in China |
| Dai and Li [215] | 2017 | RL | generic | illustrative example |
| Darbari et al. [126] | 2017 | RL | electronics | configuration of SC for electronics in New Delhi City, India |
| Diaz-Barriga-Fernandez et al. [132] | 2017 | WM | MSW, recyclables | strategic planning for MSW management in Mexico |

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| article | year | context | waste type | application description |
|---|---|---|---|---|
| Entezaminia et al. [150] | 2017 | RL | wood and paper | production and recycling planning for wood and paper industry in Iran |
| Fattahi and Govindan [167] | 2017 | RL | generic | illustrative example |
| Feito-Cespon et al. [151] | 2017 | RL | plastic | redesign of reverse SC for plastic in Cuba |
| Fu et al. [243] | 2017 | RL | C&D | illustrative example |
| Hamidieh et al. [75] | 2017 | RL | notebooks | SC ND for notebook repair and refurbish in Iran |
| Harijani et al. [121] | 2017 | WM | MSW, recyclables | model for recycling of MSW in Teheran, Iran |
| Harijani et al. [133] | 2017 | WM | MSW, recyclables | model for recycling of MSW in Teheran, Iran |
| Jeihoonian et al. [219] | 2017 | RL | durable products | illustrative example |
| Jindal and Sangwan [192] | 2017 | RL | generic | illustrative example |
| Kang et al. [68] | 2017 | RL | bottles | case study for beer company in a developing country |
| Keivanpour et al. [127] | 2017 | RL | EoL aircraft | illustrative example |
| Keshavarz Ghorabaee et al. [217] | 2017 | RL | home appliances | illustrative example |
| Li et al. [285] | 2017 | WM | MSW | integrated MSW management in Regina City, Canada |
| Mohammed et al. [152] | 2017 | RL | automotive parts | illustrative example |
| Paydar et al. [299] | 2017 | RL | engine oil | ND for oil recycling in Iran |
| Pedram et al. [220] | 2017 | RL | tires | tire remanufacturing in Iran |
| Phuc et al. [76] | 2017 | RL | ELV | illustrative example |
| Safaei et al. [300] | 2017 | RL | cardboard | paper recycling network in Amol City, Iran |
| Sampat et al. [134] | 2017 | WM | organic waste | livestock organic WM in Wisconsin State, USA |
| Sheriff et al. [260] | 2017 | WM | MSW, recyclables | optimization model for plastics recycling in India |
| Shi et al. [241] | 2017 | RL | generic | CL ND in 95 cities in Hunan Province, China + illustrative examples |
| Soleimani et al. [186] | 2017 | RL | generic | illustrative example |
| [207] | 2017 | RL | WEEE | ND for WEEE recycling in Turkey + illustrative example |
| Uster and Hwang [128] | 2017 | RL | generic | numerical remanufacturing study based on 263 largest cities in US |
| Wang et al. [181] | 2017 | RL | generic | illustrative example |
| Xu et al. [187] | 2017 | RL | e-waste | global SC design for recycling in Greece and China |
| Xu et al. [153] | 2017 | RL | plastic products | illustrative example |
| Xue et al. [290] | 2017 | WM | mixed | location of urban mines in China |
| Yu and Solvang [105] | 2017 | RL | general | illustrative example |
| Zhao and Ke [263] | 2017 | WM | explosive waste | location-routing for explosive waste from bauxite mining in Nanchuan City, China |

Table A.5: Overview of papers handling uncertainty. The rows indicate the approach to deal with uncertainty. The parameters subject to uncertainty are listed in the columns.

| approach | reference | year | demanded quantity / market size | returned quantity / waste flows / % reusability | transportation / collection cost | capacities / utilization rates | fixed opening costs | processing / operating / production costs | purchasing cost / product price | quality of returned products | delivery times / delay of product arrival | environmental impact | social impact | other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| stochastic | [197] | 2013 | ✓ | | | | | | | | | | | |
| | [108] | 2007 | ✓ | ✓ | | | | | | | | | | |
| | [129] | 2010 | | ✓ | ✓ | | | | | | | | | |
| | [225] | 2010 | ✓ | ✓ | | | | | | | | | | |
| | [158] | 2012 | | ✓ | | | | | ✓ | | | | | |
| | [169] | 2013 | ✓ | ✓ | | | | | | | | | | |
| | [226] | 2014 | ✓ | ✓ | | | | | | | | | | |
| | [213] | 2014 | ✓ | | | | | ✓ | | | | | | |
| | [143] | 2014 | ✓ | ✓ | | | | | | | | | | |
| | [199] | 2015 | | ✓ | ✓ | | | | ✓ | | | | | |
| | [81] | 2015 | ✓ | ✓ | | | | | ✓ | | | | | |
| | [208] | 2015 | | ✓ | | | ✓ | | | | | | | |
| | [194] | 2016 | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | | |
| | [73] | 2016 | ✓ | | | | | ✓ | | | | | | |
| | [214] | 2016 | | ✓ | | | | ✓ | | | | | | |
| | [167] | 2017 | ✓ | ✓ | | | | | | | | | | |
| | [151] | 2017 | ✓ | ✓ | | | | | | | | | | |
| | [219] | 2017 | | | | | | | ✓ | | | | | |
| | [128] | 2017 | ✓ | ✓ | | | | | | | | | | |
| | [105] | 2017 | | ✓ | | | | | | | ✓ | | | |
| | [227] | 2013 | ✓ | | | | | | | | | | | |
| | [124] | 2016 | ✓ | | | | | | | | | | | |
| fuzzy parameters | [195] | 2004 | | ✓ | | | | | | | | | | |
| | [190] | 2010 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | |
| | [112] | 2012 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | |
| | [155] | 2012 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | |
| | [200] | 2012 | ✓ | | ✓ | | | | | | | | | |
| | [228] | 2013 | ✓ | ✓ | | ✓ | | | | | | | | |
| | [212] | 2013 | | | | | | ✓ | | | | | | ✓ |
| | [201] | 2013 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | |
| | [202] | 2014 | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | | |
| | [65] | 2014 | ✓ | ✓ | | | | | | | | | | |
| | [229] | 2014 | ✓ | ✓ | | | | | | | | | | |
| | [113] | 2014 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | | |
| | [142] | 2014 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | |
| | [230] | 2014 | | ✓ | | | | | | | | | | |
| | [172] | 2015 | ✓ | ✓ | | ✓ | | | | | | | | |
| | [145] | 2016 | | | | ✓ | ✓ | | | | | | | |
| | [209] | 2016 | | | | ✓ | | ✓ | | | | | | |
| | [103] | 2016 | ✓ | | | ✓ | ✓ | ✓ | | | | | | ✓ |
| | [249] | 2016 | ✓ | | | | | | | | | | | |
| | [216] | 2016 | ✓ | | | ✓ | | | | | | | | |
| | [82] | 2017 | ✓ | | | | | | | | | | | |
| | [215] | 2017 | ✓ | | | ✓ | | | ✓ | | | | | |
| | [75] | 2017 | ✓ | | ✓ | | ✓ | ✓ | | | | | | |
| | [192] | 2017 | ✓ | | | ✓ | ✓ | ✓ | | | | | | ✓ |
| | [68] | 2017 | | ✓ | | | | | | | | | | ✓ |
| | [217] | 2017 | ✓ | | | ✓ | | | | | | | | |
| | [220] | 2017 | ✓ | ✓ | | | | | ✓ | | | | | |
| | [76] | 2017 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | ✓ |
| interval | [100] | 2011 | | ✓ | ✓ | ✓ | | ✓ | | | | | | ✓ |
| robust | [218] | 2006 | | ✓ | | ✓ | | | | | | | | ✓ |
| | [203] | 2011 | ✓ | ✓ | ✓ | | | | | | | | | |
| | [168] | 2012 | ✓ | | | | | | ✓ | | | | | |
| | [97] | 2012 | | | ✓ | ✓ | ✓ | | | | | | | ✓ |
| | [164] | 2013 | ✓ | ✓ | | | | | | | | | | |
| | [183] | 2013 | ✓ | ✓ | | | | | | | | | | |
| | [231] | 2014 | ✓ | | | | | | | | | | | ✓ |
| | [221] | 2014 | ✓ | ✓ | | | | | ✓ | | | | | |
| | [118] | 2015 | | ✓ | | | | | | | | | | |
| | [87] | 2015 | ✓ | ✓ | | | | | | | | | | |
| | [232] | 2015 | ✓ | ✓ | | | | | | | | | | |
| | [211] | 2016 | ✓ | ✓ | | ✓ | ✓ | | | | | | | |
| | [204] | 2016 | ✓ | | ✓ | | | ✓ | | | | | | |
| | [222] | 2016 | ✓ | ✓ | | | | | ✓ | | | | | |
| | [150] | 2017 | ✓ | | | | ✓ | ✓ | | | | | | |
| | [299] | 2017 | | ✓ | | | | | | | | | | |
| | [300] | 2017 | ✓ | | | | | | | | | | | |
| other / combinations | [295] | 2012 | ✓ | | | | | | | | | | | |
| | [223] | 2012 | | | | | | | | ✓ | | | | |
| | [236] | 2013 | | ✓ | | | | | | | | | | |
| | [135] | 2013 | | ✓ | | | | | | | | | | |
| | [205] | 2013 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | ✓ |
| | [238] | 2014 | ✓ | | | | | | | | | | | |
| | [165] | 2014 | ✓ | | ✓ | ✓ | | | | | | | | |
| | [98] | 2014 | ✓ | ✓ | | ✓ | | | | | | | | |
| | [66] | 2015 | ✓ | ✓ | | | | | ✓ | | | | | |
| | [206] | 2015 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | |
| | [92] | 2015 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | ✓ |
| | [224] | 2015 | ✓ | ✓ | | | | | | ✓ | | | | |
| | [144] | 2015 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | | |
| | [125] | 2016 | ✓ | ✓ | | | | | | | | | | |
| | [193] | 2016 | ✓ | ✓ | ✓ | | | ✓ | | | | | | |
| | [154] | 2016 | ✓ | ✓ | | | | | | | | | | |
| | [210] | 2016 | ✓ | | | | | ✓ | | | | | | |
| | [120] | 2016 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | [296] | 2017 | ✓ | ✓ | | | | | | | | | | |
| | [298] | 2017 | ✓ | ✓ | | | | | | | | | | |
| | [152] | 2017 | ✓ | ✓ | | | | | | | ✓ | | | |
| | [207] | 2017 | | ✓ | ✓ | | ✓ | ✓ | | | | | | ✓ |
| | [187] | 2017 | | ✓ | ✓ | | | | | | | | | ✓ |

Table A.6: Solution methods of reviewed models. Columns three, four and five indicate whether the model incorporates uncertainty, multiple objectives and non-linearities. When a model is linearized before solving, this is indicated by "(lin)" in column five. Column six indicates if a model is solved exactly (exact), heuristically (heur.), by a combination of both (exact + heur., e.g. global heuristic for first stage location decisions combined with an exact procedure in for allocation in a second stage) or in two separate ways (exact / heur., often to compare exact to heuristic solutions). The last column provides information about the applied heuristic, if it is specified. unc. = model incorporates uncertainty; MO = multi objective model; NL = non-linear model; GA = Genetic Algorithm; PSO = Particle Swarm Optimization; AIS = Artificial Immune System; VNS = Variable Neighborhood Search; SA = Simulated Annealing; AC = Ant Colony; ICA = Imperialist Competitive Algorithm; (A)BD = (Accelerated) Benders Decomposition; MA = Memetic Algorithm, combining GA and local search; SAA = Sample Average Approximation; VI = Variational Inequality; ABC = Artificial Bee Colony.

| article | year | unc. | MO | NL | exact / heuristic | solver / solution technique |
|---|---|---|---|---|---|---|
| Chang and Wang [174] | 1995 | | | | exact | LINDO |
| Barros et al. [88] | 1998 | | | | heur. | GAMS |
| Antunes [287] | 1999 | | | | exact | XPRESS-MP |
| Chang and Wei [188] | 1999 | | ✓ | ✓ | heur. | GA |
| Krikke et al. [280] | 1999 | | | | exact | LINDO |
| Chang and Wei [189] | 2000 | | ✓ | ✓ | heur. | GA |
| Krikke et al. [70] | 2003 | | ✓ | | exact | CPLEX |
| Schultmann et al. [89] | 2003 | | | | exact | GAMS |
| Beamon and Fernandes [136] | 2004 | | | | unclear | |
| le Blanc et al. [259] | 2004 | | | | exact + heur. | AIMMS with CPLEX + nearest neighbor and local search techniques |
| Rakas et al. [195] | 2004 | ✓ | ✓ | | exact | CPLEX |
| Hong et al. [218] | 2006 | ✓ | | | exact + heur. | CPLEX + heuristic as described in [303] |
| Gomes Salema et al. [108] | 2007 | ✓ | | | exact | GAMS + CPLEX |
| Lieckens and Vandaele [109] | 2007 | | | ✓ | heur. | GA |
| Sahyouni and Savaskan [246] | 2007 | | | | exact / heur. | CPLEX / lagrangian relaxation |
| de Figueiredo and Mayerle [156] | 2008 | | | ✓ | heur. | modified Teitz and Bart procedure coupled with Fibonacci and bisection search methods |
| Mansour and Zarei [281] | 2008 | | | | heur. | multiple start search algorithm |
| Pati et al. [94] | 2008 | | ✓ | | exact | LINDO |
| Srivastava [71] | 2008 | | | | exact | GAMS + CPLEX |
| Gomes Salema et al. [93] | 2009 | | | | exact | GAMS + CPLEX |
| Lee and Chan [233] | 2009 | | | ✓ | heur. | GA |
| Medaglia et al. [196] | 2009 | | ✓ | | exact + heur. | XPRESS-MP + GA |
| Mitropoulos et al. [99] | 2009 | | | | exact | Premium solver + XPRESS |
| Fonseca et al. [129] | 2010 | ✓ | | | exact | CPLEX |
| Gomes Salema et al. [157] | 2010 | | | | exact | GAMS + CPLEX |
| Kao et al. [282] | 2010 | | | | exact | CPLEX |
| Kara and Onut [225] | 2010 | ✓ | | | exact | GAMS + CPLEX |
| Pishvaee et al. [15] | 2010 | | ✓ | ✓(lin) | exact / heur. | LINGO / GA |
| Pishvaee and Torabi [190] | 2010 | ✓ | ✓ | | exact | LINGO |
| Wang and Hsu [234] | 2010 | | | | exact / heur. | LINGO, CPLEX / GA |
| Zarei et al. [163] | 2010 | | | | exact / heur. | LINGO / GA |
| Dai et al. [100] | 2011 | ✓ | | | unclear | |
| Gomes et al. [138] | 2011 | | | | exact | GAMS + CPLEX |
| Mar-Ortiz et al. [122] | 2011 | | | | exact +/ heur. | CPLEX +/ savings-based heuristic |
| Pishvaee et al. [203] | 2011 | ✓ | | | exact | CPLEX |
| Tuzkaya et al. [83] | 2011 | | ✓ | ✓ | heur. | GA |
| Vidovic et al. [178] | 2011 | | | | exact | LPSolve IDE |
| Abdallah et al. [295] | 2012 | ✓ | | ✓ | exact | GAMS |
| Amin and Zhang [294] | 2012 | | | | exact | GAMS |
| Assavapokee and Wongthatsanekorn [139] | 2012 | | | | exact | GAMS + CPLEX |
| Chaabane et al. [96] | 2012 | | ✓ | | exact | LINGO |
| Chatzouridis and Komilis [288] | 2012 | | | ✓(lin) | exact | Excel + LINDO add-on |
| Dat et al. [79] | 2012 | | | | exact | AMPL + CPLEX |
| Hasani et al. [168] | 2012 | ✓ | | | exact | LINGO |
| Kannan et al. [289] | 2012 | | | | exact | LINGO |
| Lee and Lee [84] | 2012 | | | ✓ | exact / heur. | LINGO / GA |
| Lieckens and Vandaele [223] | 2012 | ✓ | | ✓ | heur. | GA |
| zkr and Baslgl [302] | 2012 | | | | exact | GAMS |
| Pishvaee and Razmi [112] | 2012 | ✓ | ✓ | | exact | LINDO |
| Vahdani et al. [155] | 2012 | ✓ | | ✓ | exact | GAMS |
| Vahdani et al. [97] | 2012 | ✓ | ✓ | | exact | GAMS |
| Xu and Wei [200] | 2012 | ✓ | | | heur. | PSO-based heuristic |
| Zeballos et al. [158] | 2012 | ✓ | | | exact | GAMS + CPLEX |
| Zhou et al. [242] | 2012 | | | | heur. | PSO |
| Amin and Zhang [197] | 2013 | ✓ | ✓ | ✓ | exact | GAMS |
| Amin and Zhang [169] | 2013 | ✓ | ✓ | | exact | CPLEX |
| Cardoso et al. [227] | 2013 | ✓ | | | exact | GAMS + CPLEX |
| De Rosa et al. [164] | 2013 | ✓ | | | exact | IBM ILOG CPLEX Optimization Studio |
| Diabat et al. [235] | 2013 | | | ✓ | heur. | GA / AIS |
| Eskandarpour et al. [191] | 2013 | | ✓ | ✓(lin) | exact / heur. | LINGO, Gurobi / VNS |
| Fahimnia et al. [140] | 2013 | | | | exact | AMPL + CPLEX |
| Galan et al. [283] | 2013 | | | | exact | GAMS |
| Golebiewski et al. [236] | 2013 | ✓ | | ✓ | heur. | GA |
| Lee et al. [301] | 2013 | | | ✓ | exact | GAMS |
| zceylan and Paksoy [159] | 2013 | | | | exact | GAMS + CPLEX |
| zceylan and Paksoy [228] | 2013 | ✓ | ✓ | | exact | GAMS + CPLEX |
| zceylan and Paksoy [291] | 2013 | | | ✓ | exact | GAMS + BARON |
| zkr and Baslgl [212] | 2013 | ✓ | ✓ | | exact | GAMS + BARON |
| Phuc et al. [201] | 2013 | ✓ | | | exact | MATLAB |
| Ramezani et al. [182] | 2013 | | ✓ | | unclear | |
| Ramezani et al. [183] | 2013 | ✓ | | | exact | GAMS + CPLEX |
| Samanlioglu [101] | 2013 | | ✓ | | exact | CPLEX |
| Shokohyar and Mansour [135] | 2013 | ✓ | ✓ | | heur. | Simulation Based Optimization |
| Song et al. [237] | 2013 | | | ✓ | exact / heur. | CPLEX / GA |
| Subramanian et al. [244] | 2013 | | | | exact / heur. | CPLEX / Priority based SA |
| Vahdani et al. [205] | 2013 | ✓ | ✓ | | exact | GAMS |
| Yao et al. [258] | 2013 | | | | exact /+ heur. | LINGO / AC algorithm |
| Alumur and Tari [80] | 2014 | | ✓ | ✓(lin) | exact | CPLEX |

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| article | year | unc. | MO | NL | exact / heuristic | solver / solution technique |
|---|---|---|---|---|---|---|
| Berglund and Kwon [231] | 2014 | ✓ | | ✓(lin) | exact / heur. | CPLEX / GA |
| Chen et al. [245] | 2014 | | | ✓ | heur. | VNS |
| Demirel et al. [184] | 2014 | ✓ | ✓ | | exact /+ heur. | GAMS + CPLEX /+ GA |
| Devika et al. [64] | 2014 | | | | exact / heur. | GAMS / based on VNS and ICA |
| Faccio et al. [141] | 2014 | | | | exact | GAMS |
| Hatefi and Jolai [221] | 2014 | ✓ | | | exact | GAMS + CPLEX |
| Jindal and Sangwan [202] | 2014 | ✓ | | | exact | LINGO |
| Kaya et al. [65] | 2014 | ✓ | | | exact | GAMS + CPLEX |
| Kumar et al. [266] | 2014 | | | | exact | CPLEX |
| Litvinchev et al. [226] | 2014 | ✓ | | ✓ | exact / heur. | GAMS + DICOPT, CPLEX / Golden Selection Search |
| Mirakhorli [229] | 2014 | ✓ | ✓ | | exact / heur. | LINGO / GA |
| Ng et al. [102] | 2014 | | ✓ | | exact | GAMS + BARON |
| zceylan et al. [77] | 2014 | | | ✓ | exact | GAMS + COIN/BONMIN |
| Pishvaee et al. [113] | 2014 | ✓ | ✓ | ✓(lin) | exact | GAMS + CONOPT + CPLEX, ABD |
| Ramezani et al. [142] | 2014 | ✓ | ✓ | | exact | GAMS + CPLEX |
| Roghanian and Pazhoheshfar [238] | 2014 | ✓ | | | heur. | GA |
| Sadjadi et al. [230] | 2014 | ✓ | | ✓(lin) | exact / heur. | LINGO / MA |
| Sheriff et al. [171] | 2014 | | | ✓ | exact | LINGO |
| Soleimani and Govindan [213] | 2014 | ✓ | | | exact | CPLEX |
| Toso and Alem [165] | 2014 | ✓ | | | exact | GAMS + CPLEX |
| Vahdani and Naderi-Beni [98] | 2014 | ✓ | | | not specified | |
| Zeballos et al. [143] | 2014 | ✓ | | | exact | GAMS + CPLEX |
| Accorsi et al. [85] | 2015 | | | | exact | AMPL + Gurobi |
| Aras et al. [118] | 2015 | ✓ | | | exact | GAMS + CPLEX |
| Asefi et al. [130] | 2015 | | | | exact | GAMS + CPLEX |
| Ayvaz et al. [199] | 2015 | ✓ | | | exact + heur. | CPLEX + SAA |
| Bing et al. [255] | 2015 | | | | exact | XPRESS |
| Chen et al. [170] | 2015 | | | | exact / heur. | LINGO / GA |
| Chen et al. [81] | 2015 | ✓ | | ✓ | exact | CPLEX + integer L-shaped method + SAA |
| Choudhary et al. [185] | 2015 | | | | heur. | forest data structure algorithm |
| Dubey et al. [87] | 2015 | ✓ | ✓ | ✓(lin.) | exact + heur. | CPLEX + AC algorithm |
| Ene and ztrk [208] | 2015 | ✓ | | | exact | Gurobi |
| Ferri et al. [114] | 2015 | | | | exact | CPLEX |
| Hasani et al. [66] | 2015 | ✓ | | ✓ | exact +/ heur. | GAMS + LINDOGLOBAL +/ MA (GA + adaptive VNS) |
| Hatefi et al. [206] | 2015 | ✓ | | | exact | GAMS + CPLEX |
| Kalaitzidou et al. [123] | 2015 | | | | exact | GAMS + CPLEX |
| Kilic et al. [160] | 2015 | | | | exact | GAMS |
| Lee et al. [67] | 2015 | | ✓ | | exact / heur. | LINGO / GA |
| Moghaddam [172] | 2015 | ✓ | ✓ | | exact | LINGO |
| Moghaddam [173] | 2015 | | ✓ | | exact | LINGO |
| Mota et al. [90] | 2015 | | ✓ | | exact | GAMS + CPLEX |
| Ponce-Cueto and Molenat Muelas [292] | 2015 | | | | exact | AIMMS + CPLEX |
| Ramezani et al. [232] | 2015 | ✓ | ✓ | | exact + heur. | GAMS + CPLEX + scenario relaxation algorithm |
| Rezapour et al. [166] | 2015 | | | ✓ | exact + heur. | unspecified solver + VI, modified projection algorithm |
| Soleimani and Kannan [239] | 2015 | | | | exact / heur. | CPLEX / combination of PSO and GA |
| Subulan et al. [91] | 2015 | ✓ | ✓ | | exact | ILOG CPLEX OPL Studio |
| Subulan et al. [92] | 2015 | ✓ | ✓ | | exact | GAMS + CPLEX |
| Subulan et al. [179] | 2015 | | ✓ | | exact | ILOG CPLEX OPL Studio |
| Tokhmehchi et al. [131] | 2015 | | | | heur. | GA + Firefly Algorithm |
| Vahdani and Mohammadi [224] | 2015 | ✓ | ✓ | ✓ | exact / heur. | GAMS / self-adaptive ICA |
| Vahdani [144] | 2015 | ✓ | ✓ | | exact | GAMS |
| Vieira et al. [247] | 2015 | | | ✓ | exact / heur. | GAMS + CPLEX / AC optimization |
| Zhao and Verter [119] | 2015 | | ✓ | | exact | CPLEX |
| Zhou and Zhou [95] | 2015 | | | ✓ | exact | LINGO |
| Ameknassi et al. [194] | 2016 | ✓ | ✓ | ✓(lin.) | exact | GAMS + CPLEX |
| Cardoso et al. [124] | 2016 | ✓ | ✓ | | exact | GAMS + CPLEX |
| Dai [145] | 2016 | ✓ | ✓ | | exact | CPLEX |
| Dai and Dai [209] | 2016 | ✓ | ✓ | | exact | CPLEX |
| Demirel et al. [86] | 2016 | | | | exact | GAMS + CPLEX |
| Deng et al. [261] | 2016 | | | ✓ | heur. | hybrid AC optimization, based on AC and ABC |
| Djikanovic and Vujosevic [146] | 2016 | | | | exact | CPLEX |
| Entezaminia et al. [147] | 2016 | | ✓ | | exact | CPLEX |
| Govindan et al. [78] | 2016 | | ✓ | | exact | LINGO |
| Govindan et al. [103] | 2016 | ✓ | ✓ | | exact / heur. | LINGO / PSO |
| Hatefi et al. [211] | 2016 | ✓ | | | exact | GAMS + CPLEX |
| Jeihoonian et al. [161] | 2016 | | | | exact | CPLEX, BD with local branching and Pareto optimality cut |
| Keyvanshokooh et al. [125] | 2016 | ✓ | | | exact | GAMS + CPLEX, ABD |
| Kisomi et al. [204] | 2016 | ✓ | | | exact | GAMS + CPLEX |
| Li et al. [72] | 2016 | | ✓ | | exact / heur. | CPLEX / GA with and without local search |
| Ma et al. [193] | 2016 | ✓ | ✓ | ✓(lin.) | exact | LINGO |
| Mirmajlesi and Shafaei [249] | 2016 | ✓ | | ✓(lin.) | exact / heur. | GAMS + CPLEX / Differential Evolution and Tabu Search |
| Mohajeri and Fallah [154] | 2016 | ✓ | | | exact | GAMS |
| Ozceylan [216] | 2016 | ✓ | | | exact | GAMS |
| Qiang and Zhou [222] | 2016 | ✓ | | | exact | LINGO |
| Rahmani [293] | 2016 | | | ✓ | exact | based on Mixed Integer Non-Linear Branch-and-Bound algorithm |
| Saranwong and Likasiri [248] | 2016 | | | ✓ | exact / heur. | CPLEX / Layer Iterative Method |
| Soleimani et al. [73] | 2016 | ✓ | | | exact | CPLEX |
| Talaei et al. [210] | 2016 | ✓ | ✓ | | not specified | |
| Wang et al. [240] | 2016 | | | | exact / heur. | CPLEX / Cross-Entropy, new hybrid of Cross-Entropy and GA, GA |
| Wu and Barnes [180] | 2016 | | ✓ | | heur. | AIS |
| Yi et al. [162] | 2016 | | | | exact / heur. | LINGO / GA |
| Yu and Solvang [104] | 2016 | | ✓ | | exact | LINGO |
| Yu and Solvang [214] | 2016 | ✓ | ✓ | | exact | LINGO |
| Yuchi et al. [262] | 2016 | | | ✓ | heur. | Tabu Search |
| Zeballos et al. [148] | 2016 | | | | exact | GAMS + CPLEX |
| Zhalechian et al. [120] | 2016 | ✓ | ✓ | ✓ | exact / heur. | GAMS + BARON / GA + VNS |
| Zhao et al. [284] | 2016 | | ✓ | | exact | CPLEX |
| Zohal and Soleimani [74] | 2016 | | ✓ | | exact / heur. | LINGO / AC optimization |
| Amin et al. [296] | 2017 | ✓ | | | exact | GAMS |
| Amin and Baki [82] | 2017 | ✓ | ✓ | | exact | GAMS |
| Asgari et al. [149] | 2017 | | ✓ | ✓ | heur. | GA + Tabu Search |
| Banasik et al. [106] | 2017 | | ✓ | | exact | XPRESS-IVE |
| Budak and Ustundag [286] | 2017 | | | | exact | XPRESS-IVE |

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| article | year | unc. | MO | NL | exact / heuristic | solver / solution technique |
|---|---|---|---|---|---|---|
| Chen et al. [69] | 2017 | | ✓ | | exact / heur. | CPLEX / PSO |
| Coelho and Mateus [297] | 2017 | | | | exact / heur. | CPLEX, BD in AMPL |
| Cui et al. [298] | 2017 | ✓ | | ✓ | heur. | ABC algorithm |
| Dai and Li [215] | 2017 | ✓ | ✓ | | exact | CPLEX |
| Darbari et al. [126] | 2017 | | ✓ | | exact | LINGO |
| Diaz-Barriga-Fernandez et al. [132] | 2017 | | ✓ | ✓(lin.) | exact | GAMS + BARON |
| Entezaminia et al. [150] | 2017 | ✓ | | ✓(lin.) | exact | CPLEX |
| Fattahi and Govindan [167] | 2017 | ✓ | | | exact / heur. | GAMS + CPLEX / simulation based SA |
| Feito-Cespon et al. [151] | 2017 | ✓ | ✓ | ✓ | exact | MATLAB + SCIP |
| Fu et al. [243] | 2017 | | ✓ | | heuristic | PSO |
| Hamidieh et al. [75] | 2017 | ✓ | ✓ | ✓(lin.) | unclear | |
| Harijani et al. [121] | 2017 | | ✓ | | exact | CPLEX |
| Harijani et al. [133] | 2017 | | | | exact | CPLEX |
| Jeihoonian et al. [219] | 2017 | | | | exact | CPLEX, based on L-shaped algorithm |
| Jindal and Sangwan [192] | 2017 | ✓ | ✓ | | exact | LINGO |
| Kang et al. [68] | 2017 | ✓ | | | heur. | PSO, AIS |
| Keivanpour et al. [127] | 2017 | ✓ | ✓ | ✓ | heur. | GA |
| Li et al. [285] | 2017 | | | ✓ | heur. | iterative algorithm |
| Mohammed et al. [152] | 2017 | ✓ | | | exact | GAMS + CPLEX |
| Paydar et al. [299] | 2017 | ✓ | ✓ | | exact | LINGO |
| Pedram et al. [220] | 2017 | ✓ | | | exact | GAMS + CPLEX |
| Phuc et al. [76] ‘ | 2017 | ✓ | | | unclear | |
| Safaei et al. [300] | 2017 | ✓ | | | exact | LINGO |
| Sampat et al. [134] | 2017 | | ✓ | | exact | Gurobi |
| Sheriff et al. [260] | 2017 | | | ✓ | exact | LINGO |
| Shi et al. [241] | 2017 | | ✓ | | heur. | GA |
| Soleimani et al. [186] | 2017 | | ✓ | | exact / heur. | LINGO / GA |
| Temur and Yanik [207] | 2017 | ✓ | | | exact / heur | GAMS + CPLEX / Cloud Based Design Optimization (CBDO) |
| Uster and Hwang [128] | 2017 | ✓ | | | exact | CPLEX, enhanced BD |
| Wang et al. [181] | 2017 | | | ✓ | heur. | Plant Growth Simulation Algorithm |
| Xu et al. [187] | 2017 | ✓ | | | exact | GAMS + CPLEX |
| Xu et al. [153] | 2017 | | | | exact | IBM ILOG CPLEX Optimization Studio |
| Xue et al. [290] | 2017 | | | | exact | GIS |
| Yu and Solvang [105] | 2017 | ✓ | | | exact | LINGO |
| Zhao and Ke [263] | 2017 | | ✓ | | exact | CPLEX |

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