

Supplementary File

Manuscript Title: Logistics Center Location-Inventory-Routing Problem Optimization: A Systematic Review using PRISMA method

Table S1. Summary of Papers based on the Types of LIRP.

[illegible]

(Guo and Li 2014)								√
(Jha and Shanker 2014)	√						√	
(Nekooghadirli et al. 2014)			√		√			√
(Seyedhosseini, Bozorgi-Amiri, and Daraei 2014)	√							√
(Zhang et al. 2014)			√		√			√
(Diabat and Theodorou 2015)		√			√			
(Ghani, Shariff, and Zahari 2015)			√				√	
(Guerrero et al. 2015)			√			√		√
(Liu et al. 2015)	√							√
(Aghighi and Malmir 2016)								√
(Angazi 2016)			√		√			√
(Deng et al. 2016)	√							√
(Fan et al. 2016)								√
(Ghorbani and Akbari Jokar 2016)			√					√
(Lerhlaly et al. 2016)			√					√
(Moradi Nasab and Amin-Naseri 2016)			√		√			√
(Riquelme-Rodríguez, Gamache, and Langevin 2016)			√				√	
(Shariff et al. 2016)			√			√		√
(Tang, Ji, and Jiang 2016)								√
(R. Tavakkoli-Moghaddam 2016)			√		√			√
(Yuchi et al. 2016)			√					√
(Zhalechian et al. 2016)			√					√
(Abou El Madj et al. 2017)			√					√
(Forouzanfar et al. 2017)			√					√
(Gholamian and Heydari 2017)			√		√			
(Habibi, Asadi, and Sadjadi 2017)					√			√

(Hiassat, Diabat, and Rahwan 2017)				√					
(Nakhjirkan and Mokhatab Rafiei 2017)				√		√			√
(Rayat, Musavi, and Bozorgi-Amiri 2017)				√		√			√
(Zhao and Ke 2017)						√			√
(Zheng, Li, and Wu 2017)						√			√
(Ahmadi-Javid, Amiri, and Meskar 2018)			√						√
(Asadi et al. 2018)			√						
(Guo et al. 2018)						√			√
(Habibi, Asadi, and Sadjadi 2018)	√								√
(Kaya and Ozkok 2018)									√
(Kechmane, Nsiri, and Baalal 2018)				√		√			√
(Momenikiyai, Ebrahimnejad, and Vahdani 2018)				√		√			√
(Rafie-Majd, Pasandideh, and Naderi 2018)				√			√		√
(Sun et al. 2018)				√					
(Tavana et al. 2018)				√		√			√
(Vahdani et al. 2018)				√					
(Chen, Tian, and Yao 2019)				√					√
(Fallah-Tafti, Vahdatzad, and Sadegheiyeh 2019)			√						
(Fatemi Ghomi and Asgarian 2019)				√		√			√
(Karakostas, Sifaleras, and Georgiadis 2019)			√			√			√
(Manavizadeh, , and 2019)				√					√
(Nakhjirkan, Rafiei, and Kashan 2019)		√					√		
(Pourhejazy, Kwon, and Lim 2019)				√		√			
(Rabbani, Heidari, and Yazdanparast 2019)				√				√	
(Saif-Eddine, El-Beheiry, and El-Kharbotly 2019)			√						√
(Saragih et al. 2019)						√			√

(Zheng, Yin, and Zhang 2019)			√					√
(Biuki, Kazemi, and Alinezhad 2020)				√		√		√
(Gholipour, Ashoftehfard, and Mina 2020)				√		√		√
(Govindan et al. 2020)		√						√
(Karakostas, Sifaleras, and Georgiadis 2020b)			√			√		√
(Karakostas, Sifaleras, and Georgiadis 2020a)			√		√			√
(Kaya and Ozkok 2020)				√				
(Li, Li, and Wu 2020)						√		√
(Li and Yang 2020)			√					√
(Misni, Lee, and Seow 2020)								√
(Rahbari et al. 2020; Yavari, Enjavi, and Geraeli 2020)				√				√
(Zandkarimkhani et al. 2020)				√		√		√
(Rahbari et al. 2020)			√			√		
(Aghighi et al. 2021)								√
(Aloui, Hamani, and Delahoche 2021)				√		√		√
(Andrés Guillermo Angarita Monroy a 2021)				√		√		
(Aydemir-Karadag 2021)			√					√
(Aymen Aloui 2021)				√		√		√
(Daroudi et al. 2021)				√				√
(Goodarzian et al. 2021)				√		√		√
(Ji et al. 2021)				√		√		√
(Josiah et al. 2021)				√				
(Khalili Nasr et al. 2021)				√		√		√
(Liu et al. 2021)				√				
(Mahjoob et al. 2021)						√		√
(Misni and Lee 2021)								√

(Misni, Lee, and Jaini 2021)								√
(Morales Chavez, Costa, and Sarache 2021)				√		√		
(Nasr et al. 2021)				√		√		
(Rabbani, Mokarrari, and Akbarian-saravi 2021)				√				√
(Rahbari, Arshadi Khamseh, et al. 2021)				√		√		
(Rahbari, Razavi Hajiagha, et al. 2021)			√			√		
(Saragih et al. 2021)				√			√	√
(Shafiee Moghadam, Aghsami, and Rabbani 2021)				√		√		√
(Shima HARATI* 2021)				√				√
(Shu et al. 2021)				√		√		
(Song et al. 2021)				√				√
(Tavana et al. 2021)				√		√		√
(Wu et al. 2021)			√			√		
(Yang et al. 2021)	√						√	√
(Yuchi et al. 2021)								√
(Zarrat Dakhely Parast et al. 2021)				√		√		√
(Zhu, Wen, and Kaplan 2021)								

Table S2. Summary of Papers based on the Characteristics of LIRP.

Paper	MOP	CLSC	RL	MS	TW	GSCM	HOFV	HEFV	CP	ICRP	TR
(Ahmadi Javid and Azad 2010)									√	√	
(Ma, Yang, and Zhang 2010)	√									√	
(Ma and Dai 2010)							√			√	
(Wang 2010)							√			√	
(Yang, Ma, and Zhang 2010)	√									√	
(Hiassat and Diabat 2011)											
(Sajjadi and Cheraghi 2011)							√			√	
(Shuai, Yanhui, and Lan 2011)	√										
(Ahmadi-Javid and Seddighi 2012)							√				
(Wu et al. 2012)					√						
(Guerrero et al. 2013)							√		√	√	
(Hsieh, Liao, and Ho 2013)					√		√			√	
(Li et al. 2013)			√			√					
(Tavakkoli-Moghaddam 2013)	√									√	
(Thi Phuong Nha and Lee 2013)				√							
(Chen et al. 2014)										√	
(Deng et al. 2014)	√		√								
(Guo and Li 2014)	√										
(Jha and Shanker 2014)							√				
(Nekooghadirli et al. 2014)	√							√		√	
(Seyedhosseini, Bozorgi-Amiri, and Daraei 2014)					√		√			√	
(Zhang et al. 2014)				√			√			√	

(Ahmadi-Javid, Amiri, and Meskar 2018)											
(Asadi et al. 2018)	√			√						√	
(Guo et al. 2018)		√	√								
(Habibi, Asadi, and Sadjadi 2018)										√	
(Kaya and Ozkok 2018)											
(Kechmane, Nsiri, and Baalal 2018)							√				
(Momenikiyai, Ebrahimnejad, and Vahdani 2018)	√				√			√	√	√	
(Rafie-Majd, Pasandideh, and Naderi 2018)								√		√	
(Sun et al. 2018)							√				
(Tavana et al. 2018)	√			√					√		
(Vahdani et al. 2018)	√				√			√	√		
(Chen, Tian, and Yao 2019)				√	√				√		
(Fallah-Tafti, Vahdatzad, and Sadegheiyeh 2019)	√				√			√			
(Fatemi Ghomi and Asgarian 2019)	√						√		√		
(Karakostas, Sifaleras, and Georgiadis 2019)							√		√	√	
(Manavizadeh, , and 2019)	√				√	√		√	√		
(Nakhjirkan, Rafiei, and Kashan 2019)						√				√	
(Pourhejazy, Kwon, and Lim 2019)	√							√			
(Rabbani, Heidari, and Yazdanparast 2019)	√		√					√			
(Saif-Eddine, El-Beheiry, and El-Kharbotly 2019)	√						√				
(Saragih et al. 2019)							√		√		
(Zheng, Yin, and Zhang 2019)										√	
(Biuki, Kazemi, and Alinezhad 2020)	√							√	√		
(Gholipour, Ashoftehfar, and Mina 2020)	√					√		√	√		
(Govindan et al. 2020)	√	√	√	√	√	√		√			
(Karakostas, Sifaleras, and Georgiadis 2020b)						√	√		√	√	

(Karakostas, Sifaleras, and Georgiadis 2020a)						✓	✓	✓	✓	✓	
(Kaya and Ozkok 2020)									✓		
(Li, Li, and Wu 2020)	✓				✓		✓				
(Li and Yang 2020)									✓		
(Misni, Lee, and Seow 2020)			✓	✓							
(Rahbari et al. 2020; Yavari, Enjavi, and Geraeli 2020)											✓
(Zandkarimkhani et al. 2020)	✓				✓	✓		✓	✓		
(Rahbari et al. 2020)				✓				✓			
(Aghighi et al. 2021)									✓	✓	
(Aloui, Hamani, and Delahoche 2021)	✓						✓				
(Andrés Guillermo Angarita Monroy a 2021)	✓							✓			
(Aydemir-Karadag 2021)	✓				✓			✓			
(Aymen Aloui 2021)							✓				
(Daroudi et al. 2021)	✓					✓				✓	
(Goodarzian et al. 2021)	✓			✓		✓		✓			
(Ji et al. 2021)	✓					✓					
(Josiah et al. 2021)								✓			
(Khalili Nasr et al. 2021)	✓	✓	✓	✓	✓	✓		✓	✓		
(Liu et al. 2021)	✓						✓				
(Mahjoob et al. 2021)	✓					✓		✓		✓	
(Misni and Lee 2021)			✓			✓		✓			
(Misni, Lee, and Jaini 2021)	✓		✓			✓		✓			
(Morales Chavez, Costa, and Sarache 2021)	✓			✓		✓		✓	✓		
(Nasr et al. 2021)				✓							✓
(Rabbani, Mokarrari, and Akbarian-saravi 2021)	✓			✓		✓		✓			
(Rahbari, Arshadi Khamseh, et al. 2021)	✓				✓	✓		✓			

(Rahbari, Razavi Hajiagha, et al. 2021)				√				√	√		
(Saragih et al. 2021)									√		
(Shafiee Moghadam, Aghsami, and Rabbani 2021)	√	√	√			√			√		
(Shima HARATI* 2021)				√	√						
(Shu et al. 2021)					√						
(Song et al. 2021)	√								√		
(Tavana et al. 2021)	√			√		√			√		
(Wu et al. 2021)					√		√				
(Yang et al. 2021)	√										
(Yuchi et al. 2021)	√	√	√				√			√	
(Zarrat Dakhely Parast et al. 2021)	√		√		√	√		√	√		
(Zhu, Wen, and Kaplan 2021)					√	√					

Table S3. Summary of Papers based on the Optimization Goals of LIRP

Paper	MOP	Objective								
		TSCC	PM	TC	TTD	CS	CEEI	PSI	SCR	SC
(Ahmadi Javid and Azad 2010)		√								
(Ma, Yang, and Zhang 2010)	√	√				√				
(Ma and Dai 2010)		√								
(Wang 2010)		√								
(Yang, Ma, and Zhang 2010)	√	√				√				
(Hiassat and Diabat 2011)		√								
(Sajjadi and Cheraghi 2011)		√								
(Shuai, Yanhui, and Lan 2011)	√	√				√				
(Ahmadi-Javid and Seddighi 2012)		√								
(Wu et al. 2012)		√								
(Guerrero et al. 2013)		√								
(Hsieh, Liao, and Ho 2013)		√								
(Li et al. 2013)		√								
(Tavakkoli-Moghaddam 2013)	√	√				√				
(Thi Phuong Nha and Lee 2013)		√				√				
(Chen et al. 2014)		√								
(Deng et al. 2014)	√	√		√		√				
(Guo and Li 2014)	√	√				√				
(Jha and Shanker 2014)		√								
(Nekooghadirli et al. 2014)	√	√				√				
(Seyedhosseini, Bozorgi-Amiri, and Daraei 2014)		√								

(Zhang et al. 2014)		√								
(Diabat and Theodorou 2015)		√				√				
(Ghani, Shariff, and Zahari 2015)		√								
(Guerrero et al. 2015)		√								
(Liu et al. 2015)		√								
(Aghighi and Malmir 2016)		√								
(Angazi 2016)		√								
(Deng et al. 2016)		√								
(Fan et al. 2016)	√	√				√				
(Ghorbani and Akbari Jokar 2016)		√								
(Lerhlaly et al. 2016)		√					√			
(Moradi Nasab and Amin-Naseri 2016)			√							
(Riquelme-Rodríguez, Gamache, and Langevin 2016)		√								
(Shariff et al. 2016)		√								
(Tang, Ji, and Jiang 2016)	√	√					√			
(R. Tavakkoli-Moghaddam 2016)	√	√								√
(Yuchi et al. 2016)		√								
(Zhalechian et al. 2016)	√	√					√	√		
(Abou El Madj et al. 2017)		√					√			
(Forouzanfar et al. 2017)	√	√				√				
(Gholamian and Heydari 2017)		√								
(Habibi, Asadi, and Sadjadi 2017)		√								√
(Hiassat, Diabat, and Rahwan 2017)		√								
(Nakhjirkan and Mokhatab Rafiei 2017)		√								
(Rayat, Musavi, and Bozorgi-Amiri 2017)	√	√							√	

(Zhao and Ke 2017)	√	√							√	
(Zheng, Li, and Wu 2017)	√	√								
(Ahmadi-Javid, Amiri, and Meskar 2018)			√							
(Asadi et al. 2018)	√	√					√			
(Guo et al. 2018)		√								
(Habibi, Asadi, and Sadjadi 2018)		√								
(Kaya and Ozkok 2018)		√								
(Kechmane, Nsiri, and Baalal 2018)		√								
(Momenikiyai, Ebrahimnejad, and Vahdani 2018)	√	√				√				
(Rafie-Majd, Pasandideh, and Naderi 2018)		√								
(Sun et al. 2018)		√								
(Tavana et al. 2018)	√	√				√				√
(Vahdani et al. 2018)	√	√			√	√				
(Chen, Tian, and Yao 2019)		√								
(Fallah-Tafti, Vahdatzad, and Sadegheiyeh 2019)	√	√							√	
(Fatemi Ghomi and Asgarian 2019)	√	√							√	
(Karakostas, Sifaleras, and Georgiadis 2019)		√								
(Manavizadeh, , and 2019)	√	√					√		√	
(Nakhjirkan, Rafiei, and Kashan 2019)		√								
(Pourhejazy, Kwon, and Lim 2019)	√				√				√	
(Rabbani, Heidari, and Yazdanparast 2019)	√	√							√	
(Saif-Eddine, El-Beheiry, and El-Kharbotly 2019)	√	√							√	
(Saragih et al. 2019)		√								
(Zheng, Yin, and Zhang 2019)		√								
(Biuki, Kazemi, and Alinezhad 2020)	√	√					√	√		
(Gholipour, Ashoftehfar, and Mina 2020)	√	√								√

(Govindan et al. 2020)	√	√					√			√
(Karakostas, Sifaleras, and Georgiadis 2020b)		√								
(Karakostas, Sifaleras, and Georgiadis 2020a)		√					√			
(Kaya and Ozkok 2020)		√								
(Li, Li, and Wu 2020)	√	√							√	
(Li and Yang 2020)		√								
(Misni, Lee, and Seow 2020)		√								
(Rahbari et al. 2020; Yavari, Enjavi, and Geraeli 2020)			√							
(Zandkarimkhani et al. 2020)	√	√								√
(Rahbari et al. 2020)		√								
(Aghighi et al. 2021)		√					√			
(Aloui, Hamani, and Delahoche 2021)	√	√					√		√	
(Andrés Guillermo Angarita Monroy a 2021)	√	√				√				
(Aydemir-Karadag 2021)	√	√							√	
(Aymen Aloui 2021)		√								
(Daroudi et al. 2021)	√	√				√	√			
(Goodarzian et al. 2021)	√	√					√			
(Ji et al. 2021)	√	√					√			
(Josiah et al. 2021)		√								
(Khalili Nasr et al. 2021)	√	√					√	√	√	
(Liu et al. 2021)	√	√					√			
(Mahjoob et al. 2021)	√	√					√			
(Misni and Lee 2021)		√								
(Misni, Lee, and Jaini 2021)	√	√					√			
(Morales Chavez, Costa, and Sarache 2021)	√	√					√	√		

(Nasr et al. 2021)		√								
(Rabbani, Mokarrari, and Akbarian-saravi 2021)	√	√				√	√			
(Rahbari, Arshadi Khamseh, et al. 2021)	√	√					√		√	
(Rahbari, Razavi Hajiagha, et al. 2021)		√								
(Saragih et al. 2021)		√								
(Shafiee Moghadam, Aghsami, and Rabbani 2021)	√		√			√				
(Shima HARATI* 2021)		√								
(Shu et al. 2021)		√								
(Song et al. 2021)	√	√							√	
(Tavana et al. 2021)	√	√	√							
(Wu et al. 2021)		√								
(Yang et al. 2021)	√	√					√			
(Yuchi et al. 2021)	√	√								
(Zarrat Dakhely Parast et al. 2021)	√	√							√	
(Zhu, Wen, and Kaplan 2021)		√								

Table S4. Summary of Papers based on the Inventory Policy of LIRP

Paper	(Q, R)	(T, S)	FRP	JITD	(R,T)	POT	(R,r)	(S-1,S)
(Ahmadi Javid and Azad 2010)	√							
(Ma, Yang, and Zhang 2010)	√			√				
(Ma and Dai 2010)		√			√			
(Wang 2010)	√							
(Yang, Ma, and Zhang 2010)				√				
(Hiassat and Diabat 2011)								
(Sajjadi and Cheraghi 2011)		√						
(Shuai, Yanhui, and Lan 2011)								
(Ahmadi-Javid and Seddighi 2012)								
(Wu et al. 2012)								
(Guerrero et al. 2013)					√			
(Hsieh, Liao, and Ho 2013)	√							
(Li et al. 2013)								
(Tavakkoli-Moghaddam 2013)	√							
(Thi Phuong Nha and Lee 2013)								
(Chen et al. 2014)					√			
(Deng et al. 2014)								
(Guo and Li 2014)								
(Jha and Shanker 2014)								
(Nekooghadirli et al. 2014)	√							
(Seyedhosseini, Bozorgi-Amiri, and Daraei 2014)	√							
(Zhang et al. 2014)			√					
(Diabat and Theodorou 2015)						√		

(Ghani, Shariff, and Zahari 2015)								
(Guerrero et al. 2015)								
(Liu et al. 2015)	√							
(Aghighi and Malmir 2016)							√	
(Angazi 2016)							√	
(Deng et al. 2016)							√	
(Fan et al. 2016)								
(Ghorbani and Akbari Jokar 2016)								
(Lerhlaly et al. 2016)								
(Moradi Nasab and Amin-Naseri 2016)								
(Riquelme-Rodríguez, Gamache, and Langevin 2016)								
(Shariff et al. 2016)								
(Tang, Ji, and Jiang 2016)	√							
(R. Tavakkoli-Moghaddam 2016)								
(Yuchi et al. 2016)								
(Zhalechian et al. 2016)	√							
(Abou El Madj et al. 2017)								
(Forouzanfar et al. 2017)	√							
(Gholamian and Heydari 2017)								√
(Habibi, Asadi, and Sadjadi 2017)								√
(Hiassat, Diabat, and Rahwan 2017)								
(Nakhjirkan and Mokhatab Rafiei 2017)	√							
(Rayat, Musavi, and Bozorgi-Amiri 2017)							√	
(Zhao and Ke 2017)								
(Zheng, Li, and Wu 2017)								
(Ahmadi-Javid, Amiri, and Meskar 2018)								

(Asadi et al. 2018)								√
(Guo et al. 2018)								
(Habibi, Asadi, and Sadjadi 2018)								√
(Kaya and Ozkok 2018)								
(Kechmane, Nsiri, and Baalal 2018)								
(Momenikiyai, Ebrahimnejad, and Vahdani 2018)	√							
(Rafie-Majd, Pasandideh, and Naderi 2018)	√							
(Sun et al. 2018)								
(Tavana et al. 2018)								
(Vahdani et al. 2018)								
(Chen, Tian, and Yao 2019)								
(Fallah-Tafti, Vahdatzad, and Sadegheiyeh 2019)								
(Fatemi Ghomi and Asgarian 2019)								
(Karakostas, Sifaleras, and Georgiadis 2019)			√					
(Manavizadeh, , and 2019)								
(Nakhjirkan, Rafiei, and Kashan 2019)	√							
(Pourhejazy, Kwon, and Lim 2019)								
(Rabbani, Heidari, and Yazdanparast 2019)								
(Saif-Eddine, El-Beheiry, and El-Kharbotly 2019)								
(Saragih et al. 2019)								
(Zheng, Yin, and Zhang 2019)		√			√			
(Biuki, Kazemi, and Alinezhad 2020)								
(Gholipour, Ashoftehfar, and Mina 2020)								
(Govindan et al. 2020)								
(Karakostas, Sifaleras, and Georgiadis 2020b)			√					
(Karakostas, Sifaleras, and Georgiadis 2020a)				√				

(Kaya and Ozkok 2020)								
(Li, Li, and Wu 2020)								
(Li and Yang 2020)								
(Misni, Lee, and Seow 2020)								
(Rahbari et al. 2020; Yavari, Enjavi, and Geraeli 2020)								
(Zandkarimkhani et al. 2020)								
(Rahbari et al. 2020)								
(Aghighi et al. 2021)							√	
(Aloui, Hamani, and Delahoche 2021)								
(Andrés Guillermo Angarita Monroy a 2021)								
(Aydemir-Karadag 2021)								
(Aymen Aloui 2021)								
(Daroudi et al. 2021)	√							
(Goodarzian et al. 2021)								
(Ji et al. 2021)								
(Josiah et al. 2021)								
(Khalili Nasr et al. 2021)								
(Liu et al. 2021)								
(Mahjoob et al. 2021)	√							
(Misni and Lee 2021)								
(Misni, Lee, and Jaini 2021)								
(Morales Chavez, Costa, and Sarache 2021)								
(Nasr et al. 2021)								
(Rabbani, Mokarrari, and Akbarian-saravi 2021)								
(Rahbari, Arshadi Khamseh, et al. 2021)								
(Rahbari, Razavi Hajiagha, et al. 2021)								

(Saragih et al. 2021)								
(Shafiee Moghadam, Aghsami, and Rabbani 2021)								
(Shima HARATI* 2021)								
(Shu et al. 2021)								
(Song et al. 2021)								
(Tavana et al. 2021)								
(Wu et al. 2021)								
(Yang et al. 2021)								
(Yuchi et al. 2021)	√							
(Zarrat Dakhely Parast et al. 2021)								
(Zhu, Wen, and Kaplan 2021)								

Table S5. List of Algorithms employed in selected Papers for LIRP

Paper	Algorithm/Approaches
(Ahmadi Javid and Azad 2010)	Tabu Search(TS) and Simulated Annealing(SA)
(Ma, Yang, and Zhang 2010)	Particle swarm optimization(PSO) algorithm
(Ma and Dai 2010)	Genetic Algorithm(GA)+ C-W algorithm
(Wang 2010)	Nested lagrangian relaxation-based solution algorithm
(Yang, Ma, and Zhang 2010)	Particle Swarm Optimization (PSO) algorithm
(Hiassat and Diabat 2011)	General Algebraic Modeling System (GAMS)
(Sajjadi and Cheraghi 2011)	Two phase heuristic Simulated Annealing(SA)
(Shuai, Yanhui, and Lan 2011)	Improved Genetic Algorithm(IGA)
(Ahmadi-Javid and Seddighi 2012)	Simulated Annealing(SA)+Supplier-Distribution Allocation (SDA)+Ant Colony System (ACS) algorithm
(Wu et al. 2012)	Relax-and-fix method
(Guerrero et al. 2013)	Hybrid heuristic
(Hsieh, Liao, and Ho 2013)	GA+ K-means cluster method
(Li et al. 2013)	Hybrid Genetic-Simulated Annealing Algorithm(HGSAA)
(Tavakkoli-Moghaddam 2013)	LINGO
(Thi Phuong Nha and Lee 2013)	Global supply chain network
(Chen et al. 2014)	Two-stage heuristic algorithm based on Tabu Search (TS)
(Deng et al. 2014)	Simulated Annealing Genetic Algorithms (SAGA)
(Guo and Li 2014)	Improved Adaptive Genetic Algorithm(IAGA)
(Jha and Shanker 2014)	Two-phase Iterative approach
(Nekooghadirli et al. 2014)	Multi-objective Imperialist Competitive Algorithm (MOICA)+ Multi-objective Parallel Simulated Annealing (MOPSA)+Non-dominated Sorting Genetic Algorithm II(NSGA-II) + Pareto Archived Evolution Strategy (PAES)
(Seyedhosseini, Bozorgi-Amiri, and Daraei 2014)	LINGO+Genetic Meta-heuristic Algorithm(GMA)

(Zhang et al. 2014)	Granular Tabu Search (GTS) heuristic+Hybrid metaheuristic
(Diabat and Theodorou 2015)	CPLEX
(Ghani, Shariff, and Zahari 2015)	P-center
(Guerrero et al. 2015)	Column Generation+Lagrangian relaxation+Local search(heuristic)
(Liu et al. 2015)	Pseudo-parallel Genetic Algorithm Integrating Simulated Annealing (PPGASA)
(Aghighi and Malmir 2016)	Simulated Annealing(SA)
(Angazi 2016)	General Algebraic Modeling System (GAMS)
(Deng et al. 2016)	Hybrid Ant Colony Optimization (HACO) algorithm
(Fan et al. 2016)	Hybrid Genetic Simulated Annealing Algorithm(HGSAA)
(Ghorbani and Akbari Jokar 2016)	Imperialist Competitive-Simulated Annealing (IC-SA) algorithm
(Lerhlaly et al. 2016)	CPLEX
(Moradi Nasab and Amin-Naseri 2016)	ILOG OPL Studio 3.6
(Riquelme-Rodríguez, Gamache, and Langevin 2016)	Exchange algorithm+Adaptive large neighborhood search algorithm
(Shariff et al. 2016)	P-centers
(Tang, Ji, and Jiang 2016)	Multi-objective Particle Swarm Optimization (MOPSO) (heuristic)
(R. Tavakkoli-Moghaddam 2016)	General Algebraic Modeling System (GAMS)+CPLEX
(Yuchi et al. 2016)	New Tabu Search (NTS) algorithm
(Zhalechian et al. 2016)	Hybrid metaheuristic algorithm
(Abou El Madj et al. 2017)	Simulations
(Forouzanfar et al. 2017)	Multi-objective Parallel Simulated Annealing (MOPSA)+Non-dominated Sorting Genetic Algorithm II(NSGA-II)+Taguchi method
(Gholamian and Heydari 2017)	Multi-Echelon Technique for Recoverable Item Control (METRIC) + Simulated Annealing(SA) + Genetic Algorithm(GA)
(Habibi, Asadi, and Sadjadi 2017)	Simulated+Taguchi method+Annealing algorithm
(Hiassat, Diabat, and Rahwan 2017)	Genetic Algorithm(GA)
(Nakhjirkan and Mokhtab Rafiei 2017)	General Algebraic Modeling System (GAMS) +CPLEX +Genetic Algorithm(GA)

(Rayat, Musavi, and Bozorgi-Amiri 2017)	Archived Multi-Objective Simulated Annealing (AMOSA) +Taguchi method
(Zhao and Ke 2017)	CPLEX
(Zheng, Li, and Wu 2017)	Genetic Algorithm(GA)+Non-dominated Sorting Genetic Algorithm II(NSGA-II)
(Ahmadi-Javid, Amiri, and Meskar 2018)	Branch-and-price algorithm
(Asadi et al. 2018)	Multi-objective Particle Swarm Optimization(MOPSO)+Non-dominated Sorting Genetic Algorithm II(NSGA-II)
(Guo et al. 2018)	Simulated Annealing(SA)+Genetic Algorithm(GA)
(Habibi, Asadi, and Sadjadi 2018)	Simulated Annealing (SA)+ Genetic Algorithm (GA) + Firefly Algorithm (FA),
(Kaya and Ozkok 2018)	Simulated Annealing(SA)
(Kechmane, Nsiri, and Baalal 2018)	Genetic Algorithm(GA)
(Momenikiyai, Ebrahimnejad, and Vahdani 2018)	Multi-objective Parallel Simulated Annealing (MOPSA)+Non-dominated Sorting Genetic Algorithm II(NSGA-II)+ Pareto Envelope-based Selection Algorithm (PESA)-II
(Rafie-Majd, Pasandideh, and Naderi 2018)	Lagrangian Relaxation Method +Heuristic algorithm
(Sun et al. 2018)	LINGO
(Tavana et al. 2018)	Non-dominated Sorting Genetic Algorithm II(NSGA-II) +Reference Point based Non-dominated Sorting Genetic Algorithm-II (RPBNSGA-II)
(Vahdani et al. 2018)	Multi-objective Parallel Simulated Annealing (MOPSA)+Non-dominated Sorting Genetic Algorithm II(NSGA-II)
(Chen, Tian, and Yao 2019)	Improved Ant Colony Optimization (IACO)
(Fallah-Tafti, Vahdatzad, and Sadegheiyeh 2019)	General Algebraic Modeling System (GAMS)
(Fatemi Ghomi and Asgarian 2019)	Bio-geographical based optimization (BBO) algorithm+Particle Swarm Optimization (PSO)+CPLEX
(Karakostas, Sifaleras, and Georgiadis 2019)	General Variable Neighborhood Search (GVNS) algorithm
(Manavizadeh, , and 2019)	Multi-objective Gray Wolf Optimization (MOGWO) algorithm+Non-dominated Sorting Genetic Algorithm II(NSGA-II)
(Nakhjirkan, Rafiei, and Kashan 2019)	General Algebraic Modeling System (GAMS)+Genetic Algorithm(GA)

(Pourhejazy, Kwon, and Lim 2019)	Non-dominated Sorting Genetic Algorithm II(NSGA-II)
(Rabbani, Heidari, and Yazdanparast 2019)	Non-dominated Sorting Genetic Algorithm II(NSGA-II)+Monte Carlo simulation
(Saif-Eddine, El-Beheiry, and El-Kharbotly 2019)	Improved Genetic Algorithm (IGA)
(Saragih et al. 2019)	Simulated Annealing(SA)
(Zheng, Yin, and Zhang 2019)	Generalized Benders Decomposition (GBD) method
(Biuki, Kazemi, and Alinezhad 2020)	Genetic Algorithm(GA)+Particle Swarm Optimization (PSO)
(Gholipour, Ashoftehfar, and Mina 2020)	General Algebraic Modeling System (GAMS)+CPLEX
(Govindan et al. 2020)	Fuzzy AnalysisNetwork Process (FANP)+Fuzzy Decisionmaking Trial and Evaluation Laboratory (FDEMATEL)
(Karakostas, Sifaleras, and Georgiadis 2020b)	CPLEX+General Variable Neighborhood Search(GVNS)(metaheuristic)
(Karakostas, Sifaleras, and Georgiadis 2020a)	General Variable Neighborhood Search (GVNS)
(Kaya and Ozkok 2020)	Simulated Annealing (SA)heuristic approach
(Li, Li, and Wu 2020)	Multi-objective Ant Colony Optimization (MACO)
(Li and Yang 2020)	Improved Tabu Search(ITS) algorithm
(Misni, Lee, and Seow 2020)	Hybrid Harmony Search-Simulated Annealing (HS-SA) algorithm
(Rahbari et al. 2020; Yavari, Enjavi, and Geraeli 2020)	Genetic Algorithm (GA) metaheuristic)
(Zandkarimkhani et al. 2020)	General Algebraic Modeling System (GAMS)+CPLEX
(Rahbari et al. 2020)	General Algebraic Modeling System (GAMS)
(Aghighi et al. 2021)	General Algebraic Modeling System (GAMS) + Improved Genetic Algorithm (IGA)
(Aloui, Hamani, and Delahoche 2021)	K-means Clustering+Genetic Algorithm(GA)

(Andrés Guillermo Angarita Monroy a 2021)	Non-dominated Sorting Genetic Algorithm version II (NSGA-II)+ Strength Pareto Evolutionary Algorithm version II (SPEA-II) + Genetic Algorithm (GA)
(Aydemir-Karadag 2021)	Bi-Objective Adaptive Large Neighborhood Search Algorithm (BOALNS)
(Aymen Aloui 2021)	CPLEX
(Daroudi et al. 2021)	Non-dominated Sorting Genetic Algorithm II(NSGA-II)+ Pareto Envelope-based Selection Algorithm II (PESA-II)
(Goodarzian et al. 2021)	Hybrid Firefly Algorithm and Simulated Annealing (HFFA-SA) + Hybrid Firefly Algorithm and Social Engineering Optimization (HFFASEO)
(Ji et al. 2021)	A multi-objective particle swarm optimization (MOPSO) heuristic solution procedure
(Josiah et al. 2021)	General Algebraic Modeling System (GAMS)
(Khalili Nasr et al. 2021)	General Algebraic Modeling System (GAMS)
(Liu et al. 2021)	YALMIP MATLAB toolbox
(Mahjoob et al. 2021)	Non-dominated Sorting Genetic Algorithms II (NSGA-II)+Non-dominated Ranked Genetic algorithm (NRGA)+Strength Pareto Evolutionary Algorithm II(SPEA-II)+ Pareto Envelope-based Selection Algorithm II(PESA-II)
(Misni and Lee 2021)	Modified Harmony Search (MHS) algorithm +Multi-local Neighbourhood Search Techniques.
(Misni, Lee, and Jaini 2021)	Multi-Objective Hybrid Harmony Search-Simulated Annealing (MOHS-SA) algorithm
(Morales Chavez, Costa, and Sarache 2021)	Simulated Annealing(SA) algorithm
(Nasr et al. 2021)	Lagrangian Relaxation +Genetic Algorithm (GA)
(Rabbani, Mokarrari, and Akbarian-saravi 2021)	Lexicographic+AUGMECON2 approaches+TOPSIS method
(Rahbari, Arshadi Khamseh, et al. 2021)	Multi-objective Black Widow Optimization (MOBWO) algorithm
(Rahbari, Razavi Hajiagha, et al. 2021)	General Algebraic Modeling System (GAMS)
(Saragih et al. 2021)	Simulated Annealing(SA) algorithm
(Shafiee Moghadam, Aghsami, and Rabbani 2021)	Hybrid Two-level Non-dominated Sort Genetic Algorithm.
(Shima HARATI* 2021)	Two variability criteria(PLDM and PLDT)
(Shu et al. 2021)	Improved Ant Colony Optimization(IACO)

(Song et al. 2021)	Lagrange Relaxation and Modified Genetic Algorithm (LR-MGA)
(Tavana et al. 2021)	General Algebraic Modeling System (GAMS)+CPLEX
(Wu et al. 2021)	Simulated Annealing(SA)
(Yang et al. 2021)	Non-dominated Sorting Genetic Algorithms(NSGA)-III algorithm
(Yuchi et al. 2021)	Tabu Search(TS) +Simulated Annealing(SA)
(Zarrat Dakhely Parast et al. 2021)	General Algebraic Modeling System (GAMS)+CPLEX
(Zhu, Wen, and Kaplan 2021)	Improved Genetic Algorithm (IGA)

Table S6: Summary of Papers based on the Model and Solution Approaches of LIRP

Paper	model	Exact	Heuristic/Metaheuristic	Others Approaches
(Ahmadi Javid and Azad 2010)	MIP		√	
(Ma, Yang, and Zhang 2010)	MIP		√	
(Ma and Dai 2010)	MIP		√	
(Wang 2010)	MINLP	√		
(Yang, Ma, and Zhang 2010)	MINLP		√	
(Hiassat and Diabat 2011)	MIP	√		
(Sajjadi and Cheraghi 2011)	MILP		√	
(Shuai, Yanhui, and Lan 2011)	MILP		√	
(Ahmadi-Javid and Seddighi 2012)	MIP		√	
(Wu et al. 2012)	MILP			√
(Guerrero et al. 2013)	MILP		√	
(Hsieh, Liao, and Ho 2013)	MILP		√	
(Li et al. 2013)	MILP		√	
(Tavakkoli-Moghaddam 2013)	MINLP	√		
(Thi Phuong Nha and Lee 2013)	MILP	√		
(Chen et al. 2014)	MIP		√	
(Deng et al. 2014)	MIP		√	
(Guo and Li 2014)	MIP		√	
(Jha and Shanker 2014)	MIP		√	
(Nekooghadirli et al. 2014)	MIP		√	
(Seyedhosseini, Bozorgi-Amiri, and Daraei 2014)	MINLP	√	√	
(Zhang et al. 2014)	MILP		√	
(Diabat and Theodorou 2015)	MINLP	√		

(Ghani, Shariff, and Zahari 2015)	MIP	√		
(Guerrero et al. 2015)	MIP	√	√	
(Liu et al. 2015)	MIP		√	
(Aghighi and Malmir 2016)	MIP		√	
(Angazi 2016)	MINLP	√		
(Deng et al. 2016)	MINLP		√	
(Fan et al. 2016)	MIP		√	
(Ghorbani and Akbari Jokar 2016)	MIP		√	
(Lerhlaly et al. 2016)	MILP	√		
(Moradi Nasab and Amin-Naseri 2016)	MILP	√		
(Riquelme-Rodríguez, Gamache, and Langevin 2016)	MIP		√	
(Shariff et al. 2016)	MILP	√		
(Tang, Ji, and Jiang 2016)	MIP		√	
(R. Tavakkoli-Moghaddam 2016)	MILP	√		
(Yuchi et al. 2016)	MINLP		√	
(Zhalechian et al. 2016)	MINLP		√	
(Abou El Madj et al. 2017)	MINLP			√
(Forouzanfar et al. 2017)	MINLP		√	
(Gholamian and Heydari 2017)	MIP		√	
(Habibi, Asadi, and Sadjadi 2017)	MIP		√	
(Hiassat, Diabat, and Rahwan 2017)	MIP		√	
(Nakhjirkan and Mokhatab Rafiei 2017)	MINLP	√	√	
(Rayat, Musavi, and Bozorgi-Amiri 2017)	MINLP		√	
(Zhao and Ke 2017)	MILP	√		
(Zheng, Li, and Wu 2017)	MINLP		√	
(Ahmadi-Javid, Amiri, and Meskar 2018)	MILP	√		

(Asadi et al. 2018)	MIP		√	
(Guo et al. 2018)	MINLP		√	
(Habibi, Asadi, and Sadjadi 2018)	MINLP		√	
(Kaya and Ozkok 2018)	MINLP		√	
(Kechmane, Nsiri, and Baalal 2018)	MILP		√	
(Momenikiyai, Ebrahimnejad, and Vahdani 2018)	MINLP		√	
(Rafie-Majd, Pasandideh, and Naderi 2018)	MINLP	√	√	
(Sun et al. 2018)	MILP	√		
(Tavana et al. 2018)	MILP		√	
(Vahdani et al. 2018)	MIP		√	
(Chen, Tian, and Yao 2019)	MIP		√	
(Fallah-Tafti, Vahdatzad, and Sadegheiyeh 2019)	MILP	√		
(Fatemi Ghomi and Asgarian 2019)	MINLP		√	
(Karakostas, Sifaleras, and Georgiadis 2019)	MIP		√	
(Manavizadeh, , and 2019)	MINLP		√	
(Nakhjirkan, Rafiei, and Kashan 2019)	MINLP	√	√	
(Pourhejazy, Kwon, and Lim 2019)	MIP		√	
(Rabbani, Heidari, and Yazdanparast 2019)	MINLP		√	
(Saif-Eddine, El-Beheiry, and El-Kharbotly 2019)	MINLP		√	
(Saragih et al. 2019)	MINLP		√	
(Zheng, Yin, and Zhang 2019)	MIP	√		
(Biuki, Kazemi, and Alinezhad 2020)	MIP		√	
(Gholipour, Ashoftehfar, and Mina 2020)	MILP	√		
(Govindan et al. 2020)	MILP			√
(Karakostas, Sifaleras, and Georgiadis 2020b)	MILP	√	√	
(Karakostas, Sifaleras, and Georgiadis 2020a)	MIP		√	

(Kaya and Ozkok 2020)	MINLP		√	
(Li, Li, and Wu 2020)	MILP		√	
(Li and Yang 2020)	MILP		√	
(Misni, Lee, and Seow 2020)	MIP		√	
(Rahbari et al. 2020; Yavari, Enjavi, and Geraeli 2020)	MINLP		√	
(Zandkarimkhani et al. 2020)	MILP	√		
(Rahbari et al. 2020)	MILP	√		
(Aghighi et al. 2021)	MINLP	√	√	
(Aloui, Hamani, and Delahoche 2021)	MIP	√	√	
(Andrés Guillermo Angarita Monroy a 2021)	MILP		√	
(Aydemir-Karadag 2021)	MINLP		√	
(Aymen Aloui 2021)	MILP	√		
(Daroudi et al. 2021)	MILP		√	
(Goodarzian et al. 2021)	MILP		√	
(Ji et al. 2021)	MILP		√	
(Josiah et al. 2021)	MILP	√		
(Khalili Nasr et al. 2021)	MILP	√		
(Liu et al. 2021)	MIP	√		
(Mahjoob et al. 2021)	MINLP		√	
(Misni and Lee 2021)	MILP		√	
(Misni, Lee, and Jaini 2021)	MILP		√	
(Morales Chavez, Costa, and Sarache 2021)	MINLP		√	
(Nasr et al. 2021)	MILP	√	√	
(Rabbani, Mokarrari, and Akbarian-saravi 2021)	MINLP			√
(Rahbari, Arshadi Khamseh, et al. 2021)	MILP		√	
(Rahbari, Razavi Hajiagha, et al. 2021)	MILP	√		

(Saragih et al. 2021)	MINLP		√	
(Shafiee Moghadam, Aghsami, and Rabbani 2021)	MINLP		√	
(Shima HARATI* 2021)	MIP			√
(Shu et al. 2021)	MILP		√	
(Song et al. 2021)	MINLP	√	√	
(Tavana et al. 2021)	MILP	√		
(Wu et al. 2021)	MINLP	√		
(Yang et al. 2021)	MINLP		√	
(Yuchi et al. 2021)	MINLP		√	
(Zarrat Dakhely Parast et al. 2021)	MILP	√		
(Zhu, Wen, and Kaplan 2021)	MIP		√	

MIP: Mixed Integral Programming; MILP: Mixed Integral Linear Programming; MINLP: Mixed Integral Nonlinear Programming.

Table S7: Summary of Papers based on the Application of LIRP

Paper	ECLS	HSC	PPLN	CCL	ESSC	HUSC	HEL	Others
(Ahmadi Javid and Azad 2010)								
(Ma, Yang, and Zhang 2010)								√
(Ma and Dai 2010)								
(Wang 2010)								
(Yang, Ma, and Zhang 2010)								
(Hiassat and Diabat 2011)								
(Sajjadi and Cheraghi 2011)								
(Shuai, Yanhui, and Lan 2011)								√
(Ahmadi-Javid and Seddighi 2012)								
(Wu et al. 2012)								
(Guerrero et al. 2013)								
(Hsieh, Liao, and Ho 2013)								
(Li et al. 2013)	√							
(Tavakkoli-Moghaddam 2013)								
(Thi Phuong Nha and Lee 2013)								
(Chen et al. 2014)	√							
(Deng et al. 2014)	√							
(Guo and Li 2014)	√							
(Jha and Shanker 2014)								
(Nekooghadirli et al. 2014)								
(Seyedhosseini, Bozorgi-Amiri, and Daraei 2014)								
(Zhang et al. 2014)								
(Diabat and Theodorou 2015)								

(Ghani, Shariff, and Zahari 2015)								
(Guerrero et al. 2015)								
(Liu et al. 2015)	√							
(Aghighi and Malmir 2016)			√					
(Angazi 2016)								
(Deng et al. 2016)	√							
(Fan et al. 2016)								
(Ghorbani and Akbari Jokar 2016)								
(Lerhlaly et al. 2016)		√						
(Moradi Nasab and Amin-Naseri 2016)		√						
(Riquelme-Rodríguez, Gamache, and Langevin 2016)								√
(Shariff et al. 2016)				√				
(Tang, Ji, and Jiang 2016)		√						
(R. Tavakkoli-Moghaddam 2016)								
(Yuchi et al. 2016)								
(Zhalechian et al. 2016)					√			
(Abou El Madj et al. 2017)		√						
(Forouzanfar et al. 2017)					√			
(Gholamian and Heydari 2017)								
(Habibi, Asadi, and Sadjadi 2017)								
(Hiassat, Diabat, and Rahwan 2017)			√					
(Nakhjirkan and Mokhatab Rafiei 2017)					√			
(Rayat, Musavi, and Bozorgi-Amiri 2017)								
(Zhao and Ke 2017)		√						
(Zheng, Li, and Wu 2017)				√				
(Ahmadi-Javid, Amiri, and Meskar 2018)								

(Asadi et al. 2018)		√						
(Guo et al. 2018)					√			
(Habibi, Asadi, and Sadjadi 2018)		√						
(Kaya and Ozkok 2018)							√	
(Kechmane, Nsiri, and Baalal 2018)								
(Momenikiyai, Ebrahimnejad, and Vahdani 2018)								
(Rafie-Majd, Pasandideh, and Naderi 2018)			√					
(Sun et al. 2018)			√					
(Tavana et al. 2018)						√		
(Vahdani et al. 2018)						√		
(Chen, Tian, and Yao 2019)			√					
(Fallah-Tafti, Vahdatzad, and Sadegheiyeh 2019)								√
(Fatemi Ghomi and Asgarian 2019)			√					
(Karakostas, Sifaleras, and Georgiadis 2019)								
(Manavizadeh, , and 2019)					√			
(Nakhjirkan, Rafiei, and Kashan 2019)								
(Pourhejazy, Kwon, and Lim 2019)		√						
(Rabbani, Heidari, and Yazdanparast 2019)		√						
(Saif-Eddine, El-Beheiry, and El-Kharbotly 2019)								
(Saragih et al. 2019)			√					
(Zheng, Yin, and Zhang 2019)								√
(Biuki, Kazemi, and Alinezhad 2020)			√					
(Gholipour, Ashoftehfar, and Mina 2020)					√			
(Govindan et al. 2020)					√			
(Karakostas, Sifaleras, and Georgiadis 2020b)		√						
(Karakostas, Sifaleras, and Georgiadis 2020a)		√						

(Kaya and Ozkok 2020)							√	
(Li, Li, and Wu 2020)				√				
(Li and Yang 2020)								
(Misni, Lee, and Seow 2020)								
(Rahbari et al. 2020; Yavari, Enjavi, and Geraeli 2020)			√					
(Zandkarimkhani et al. 2020)			√				√	
(Rahbari et al. 2020)			√					
(Aghighi et al. 2021)			√					
(Aloui, Hamani, and Delahoche 2021)			√					
(Andrés Guillermo Angarita Monroy a 2021)						√		
(Aydemir-Karadag 2021)		√						
(Aymen Aloui 2021)			√					
(Daroudi et al. 2021)			√					
(Goodarzian et al. 2021)							√	
(Ji et al. 2021)		√						
(Josiah et al. 2021)								
(Khalili Nasr et al. 2021)					√			
(Liu et al. 2021)			√					
(Mahjoob et al. 2021)			√					
(Misni and Lee 2021)								
(Misni, Lee, and Jaini 2021)					√			
(Morales Chavez, Costa, and Sarache 2021)		√						
(Nasr et al. 2021)			√					
(Rabbani, Mokarrari, and Akbarian-saravi 2021)								
(Rahbari, Arshadi Khamseh, et al. 2021)		√						
(Rahbari, Razavi Hajiagha, et al. 2021)			√					

(Saragih et al. 2021)			√					
(Shafiee Moghadam, Aghsami, and Rabbani 2021)	√				√			
(Shima HARATI* 2021)			√					
(Shu et al. 2021)				√				
(Song et al. 2021)								
(Tavana et al. 2021)					√			
(Wu et al. 2021)								
(Yang et al. 2021)							√	
(Yuchi et al. 2021)					√			
(Zarrat Dakhely Parast et al. 2021)					√			
(Zhu, Wen, and Kaplan 2021)				√				

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