



Project no: 043268

Project acronym: PATRES

## **PATTERN RESILIENCE**

Instrument: STREP

Thematic Priority: New and Emerging Science and Technology

### **Final management report**

Period covered: from 01/02/2007 to 31/01/2010

Date of preparation: 15/03/2010

Start date of project: 01/02/2007

Duration: 36 months

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Project coordinator organisation: Cemagref

Revision: Version 1

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## **Section 1 - Justification of major cost items and resources**

### **Brief description of work of each partner in each workpackage.**

#### **Partner 1: Cemagref**

##### *Workpackage 1 (Case studies)*

- Development of the pilot and refined version of the bacteria model. The study of the second version (including bacteria motility) led to the identification of regular and labyrinth patterns.
- Approximation of a pattern dynamics from the bacteria the first and second version model, using moment approximation.
- Computation of the viability and resilience based on these models, through a function approximation.
- Collaboration with UIB, CNRS and UFZ for the computation of viability kernel and resilience indices on their case studies.

##### *Workpackage 2 (Pattern dynamics)*

- Development of a first version of SimExplorer in period 1
- Improvement of SimExplorer in period 2: improvement of the user interface, inclusion of new experimental designs, improvement of the functionalities to launch simulations on a computer grid.

##### *Workpackage 3 (Resilience)*

- Development of a first version of KAVIAR in period 1
- Development of an improved version of KAVIAR in period 2: inclusion of several optimisation methods for computing the action (conjugate gradient, Newton method).
- Development of new methods for robust control taking the distance to the boundary of the viability kernel into account.

##### *Workpackage 4 (Dissemination)*

- Dissemination of results on publications and conference presentations.
- Participation to workshop about the project results in ECSS (Warwick, September 2009).
- Participation to the course about the project methods in Madeira (October 2009).
- Collaboration with UniS on the coordination and edition of the book.

##### *Workpackage 5 (Management)*

- Co-organisation of the ECSS workshop.
- Preparation and animation of management meetings.
- Coordination of the mid-term and final reports.

#### **Partner 2: University of Surrey (UniS)**

##### *Workpackage 1 (Case studies)*

- Preliminary study of biotech firm network model (description in ODD).

- Data collection and analysis about Web 2.0 (Flickr, wikisphere, and open source development communities)
- Development of pilot dynamical models (collaboration with UIB).

*Workpackage 2 (Pattern dynamics)*

- Study of statistical patterns in the data from Flickr and wikisphere

*Workpackage 3 (Resilience and viability)*

No methodological input from UniS.

*Workpackage 4 (Dissemination)*

- The project website has been running since the start of the project and is gradually expanding to cover the results of our work.
- Organisation of Warwick dissemination workshop (September 24, 2009).
- Organisation of tutorial course in Madeira (October 21-23, 2009).

*Workpackage 5 (Management)*

- Participation in management meetings and other communications and visits with partners.

**Partner 3: Universitat Illes Balear UIB**

*Workpackage 1 (case studies)*

- Study of the effects of social network communities on the dynamics of language competition
- Development of java applet for visualization of microscopic language competition model
- Collaboration with Cemagref on a pilot calculation of viability and resilience for the language competition case study
- Characterization of the role of prestige and volatility in language dynamics through simulations of the IBMs of language competition
- Derivation and analysis of macroscopic descriptions of language dynamics models in different complex networks.
- Study of the effects of tree-tree establishment competition and fire on savanna dynamics (collaboration with UZF).
- Study of tree-grass coexistence: the "savanna problem"(collaboration with UZF).
- Study of Group formation and homophily in the Flickr online community (collaboration with UniS)
- Micro-macro connection in the description of formation of bacterial and polymeric patterns in microbial films (collaboration with LISC-Cemagref)

*Workpackage 2 (Pattern Dynamics)*

- Developing, explaining and making available to other partners two main theoretical tools for the study of pattern dynamics (KL and derivation of macroscopic equations)
- Analysis and methodological study of niche models relevant for several case studies
- Collaboration with Cemagref in the implementation in SimExplorer of the microscopic language competition dynamics.

In period 2, further progress in relating the microscopic dynamics and the macroscopic behaviour

of individual based models along several lines:

- From microscopic to macroscopic dynamics for systems with two symmetric absorbing states,
- Competitive interactions,
- Master equation description of noisy dynamics.

Each of these lines led to publications.

*Workpackage 3 (Resilience)*

- Criticisms of the first presentation of resilience recommending a clearer link with existing more widely perceived view of resilience.
- Collaboration with LISC-Cemagref in a final calculation of viability and resilience of the language competition case study

*Workpackage 4 (Dissemination)*

- Participation in the workshop on Pattern Resilience at ECCS 2009, September 24, 2009, University of Warwick
- Participation in the tutorial workshop on Simplifying individual-based models and computing viable or resilient action policies, MADEIRA 21-23 October 2009
- Contacts with editorials for the possible publication of a book containing main PATRES results.
- Contribution to PATRES book on the language competition case study

*Workpackage 5 (Management)*

- Participation in management meetings and other communications and visits with partners.

**Partner 4: UFZ Centre for Environmental Research**

*Workpackage 1 (Case studies)*

- Coordination of the work on case studies.
- Development of a pilot and a refined versions of the savanna model. The refined version is more closely derived from the Jeltsch model.
- Development of fire model in savannas.
- Approximation of a pattern dynamics from the savanna pilot and refined model (collaboration with UIB),
- Computation of the viability and resilience based on this model (collaboration with Cemagref).

*Workpackage 2 (Pattern dynamics)*

- Literature research about moment approximation (collaboration with UIB).
- Detection of patterns with the refined savanna model where the pair approximation model is more appropriate.

*Workpackage 3 (Resilience)*

- Literature review about resilience (see chapter 2 of the book), and contribution to the connection between viability-based resilience and different views of resilience in ecology (chapter 3).

*Workpackage 4 (Dissemination)*

- Participation in the workshop on Pattern Resilience at ECCS 2009, September 24, 2009, University of Warwick
- Participation in the tutorial workshop on Simplifying individual-based models and computing viable or resilient action policies, MADEIRA 21-23 October 2009
- Paper publications
- Contribution to PATRES book on the resilience chapters and on the savanna case study chapter.

*Workpackage 5 (Management)*

- Participation in management meetings and communication with other partners.
- Organisation of plenary meeting in Bad-Schandau 13-15 October 2008.

**Partner 5: Centre National de la Recherche Scientifique**

*Workpackage 1 (Case studies)*

- Development of the pilot and refined version of the social dilemma model,
- Approximation of a pattern dynamics from the social dilemma pilot model (collaboration with UIB),
- Computation of the viability and resilience based on pilot and refined model (collaboration with Cemagref),
- Exploration of scientific field pattern dynamics.

*Workpackage 2 (Pattern dynamics)*

- Settlement of the PC cluster to be used for intensive computation experiments to identify patterns.
- Collaboration with Cemagref for the development of grid and cluster use facilities in SimExplorer.

*Workpackage 3 (Resilience)*

- Use of KAVIAR in the social dilemma case study.

*Workpackage 4 (Dissemination)*

- Paper publications and participation to conferences.
- Participation in the tutorial workshop on Simplifying individual-based models and computing viable or resilient action policies, MADEIRA 21-23 October 2009
- Contribution to PATRES book on the resilience chapters and on the prisoner's dilemma case study chapter.

*Workpackage 5 (Management)*

- Participation in management meetings and communication with other partners.
- Organisation of plenary meeting 5 in Paris (25-27 March 2009)

## Comments on labour effort and expenses compared with plan

Tables 1 and 2 give the figures of actual budget spent and actual man.months of activity of the project, compared with their initial budget, for the whole project.

Globally, in the whole project, we consumed 117% of the planned man.months and 110% of the planned budget. The global effort has been higher in the second period than in the first one (54% for man.months and 55% for the costs). The counted man.months are only the ones which are eligible. The non-eligible man.months represent about 10 to 15% of the total.

This indicates a willingness of most partners to invest more than initially planned in the project.

A closer look at the activity of each partner suggests the following comments:

- Cemagref obviously made a high investment on this project (216% in man.months, 151% in budget). Moreover, some of the activity on the project has been financed from other means (especially on WP1), and does not appear in the tables.
- CNRS man.month expense is lower than planned (68% in total), but global costs are closer to the initial plan (90%). This is because senior researchers worked on the project instead of PhD students as initially planned. Moreover, CNRS involvement in WP3 has been lower than planned because of the departure of the researcher who had this task in charge. Cemagref compensated this change.
- UniS man.months expense is significantly higher than planned (114%) for a global cost of 90% of the initial budget. The reason of this discrepancy is probably the devaluation of the pound during the period.

Person-Month Status Table							
CONTRACT N°: 43268		TOTALS	1. Cemagref	2. UniS	3. UIB	4. UFZ	5. CNRS
ACRONYM: PATRES							
PERIOD: Total from 1/02/07 to 31/01/10							
(man.months with eligible costs)							
Workpackage 1: Case studies	Actual WP total:	78,86	8,7	18	20,4	21,76	10
	Planned WP total:	67,8	9	12	16	20,8	10
Workpackage 2: Pattern dynamics	Actual WP total:	95,4	41,5	4,5	22,9	15	11,5
	Planned WP total:	65	13	5	20	13	14
Workpackage 3: Resilience	Actual WP total:	104,9	40,9	4,5	13,5	11	35
	Planned WP total:	97	15	5	13	11	53
Workpackage 4: Dissemination	Actual WP total:	28,3	4,8	14	5,5	3	1
	Planned WP total:	32	5	14	4	3	6
Workpackage 5: Management	Actual WP total:	4,6	3,6	0	1	0	0
	Planned WP total:	6	4	0	1	0	1
Actual total:		312,06	99,5	41	63,3	50,76	57,5
Planned total:		267,8	46	36	54	47,8	84

Table 1: Person-Month Status for the whole project.

PATRES – NEST 43268 – Management report of period 2.

Contract N°: 43268		Acronym: PATRES				Date : 15/03/2010			
PARTICIPANTS	TYPE of EXPENDITURE	BUDGET e	ACTUAL COSTS (EUR)			Pct spent			Remaining Budget (EUR) e-e1
			Period 1 a1	Period 2 b1	Total e1	Period 1 a1/e	Period 2 b1/e	Total a1+b1/e	
1-Cemagref	<b>Total Person-month</b>	<b>46,0</b>	53,0	46,5	<b>99,5</b>	115%	101%	216%	<b>-53,5</b>
	Personnel costs	<b>444 250,0</b>	345 081,6	368 766,8	<b>713 848,4</b>	78%	83%	161%	<b>-269 598,4</b>
	Equipment				<b>0,0</b>	0%	0%	0%	<b>0,0</b>
	Travel	<b>30 000,0</b>			<b>0,0</b>	0%	0%	0%	<b>30 000,0</b>
	Other costs				<b>0,0</b>	0%	0%	0%	<b>0,0</b>
	<b>Total Costs</b>	<b>474 250,0</b>	<b>345 081,6</b>	<b>368 766,8</b>	<b>713 848,4</b>	<b>73%</b>	<b>78%</b>	<b>151%</b>	<b>-239 598,4</b>
2-UniS	<b>Total Person-month</b>	<b>36,0</b>	18,0	23,0	<b>41,0</b>	50%	64%	114%	<b>-5,0</b>
	Personnel costs	<b>173 736,0</b>	65 265,9	84 456,2	<b>149 722,1</b>	38%	49%	86%	<b>24 013,9</b>
	Equipment				<b>0,0</b>	0%	0%	0%	<b>0,0</b>
	Travel	<b>31 500,0</b>	10 262,1	20 859,8	<b>31 121,8</b>	33%	66%	99%	<b>378,2</b>
	Other costs	<b>45 047,2</b>	17 238,0	24 263,7	<b>41 501,7</b>	38%	54%	92%	<b>3 545,5</b>
	<b>Total Costs</b>	<b>250 283,2</b>	<b>92 765,9</b>	<b>129 579,7</b>	<b>222 345,6</b>	<b>37%</b>	<b>52%</b>	<b>89%</b>	<b>27 937,6</b>
3-UIB	<b>Total Person-month</b>	<b>54,0</b>	28,3	35,0	<b>63,3</b>	52%	65%	117%	<b>-9,3</b>
	Personnel costs	<b>408 100,0</b>	231 593,7	232 607,4	<b>464 201,1</b>	57%	57%	114%	<b>-56 101,1</b>
	Equipment	<b>10 000,0</b>	1 521,9	2 899,7	<b>4 421,6</b>	15%	29%	44%	<b>5 578,4</b>
	Travel	<b>30 000,0</b>	9 580,9	18 690,4	<b>28 271,3</b>	32%	62%	94%	<b>1 728,7</b>
	Other costs	<b>7 120,0</b>	2 853,9	5 731,4	<b>8 585,3</b>	40%	80%	121%	<b>-1 465,3</b>
	<b>Total Costs</b>	<b>455 220,0</b>	<b>245 550,4</b>	<b>259 928,8</b>	<b>505 479,2</b>	<b>54%</b>	<b>57%</b>	<b>111%</b>	<b>-50 259,2</b>
4-UFZ	<b>Total Person-month</b>	<b>47,8</b>	19,8	31,0	<b>50,8</b>	41%	65%	106%	<b>-3,0</b>
	Personnel costs	<b>437 010,0</b>	161 494,5	273 320,1	<b>434 814,6</b>	37%	63%	99%	<b>2 195,4</b>
	Equipment				<b>0,0</b>	0%	0%	0%	<b>0,0</b>
	Travel	<b>17 500,0</b>	6 064,1	11 123,3	<b>17 187,4</b>	35%	64%	98%	<b>312,6</b>
	Other costs	<b>9 500,0</b>	7 404,0	1 209,8	<b>8 613,8</b>	78%	13%	91%	<b>886,2</b>
	<b>Total Costs</b>	<b>464 010,0</b>	<b>174 962,6</b>	<b>285 653,2</b>	<b>460 615,8</b>	<b>38%</b>	<b>62%</b>	<b>99%</b>	<b>3 394,2</b>
5-CNRS	<b>Total Person-month</b>	<b>84,0</b>	26,0	31,5	<b>57,5</b>	31%	38%	68%	<b>26,5</b>
	Personnel costs	<b>305 592,0</b>	174 932,3	87 595,6	<b>262 527,9</b>	57%	29%	86%	<b>43 064,1</b>
	Equipment	<b>100 000,0</b>	86 064,7	7 977,5	<b>94 042,2</b>	86%	8%	94%	<b>5 957,8</b>
	Travel	<b>16 000,0</b>	5 291,9	14 907,9	<b>20 199,8</b>	33%	93%	126%	<b>-4 199,8</b>
	Other costs	<b>23 170,0</b>	18 271,3	3 573,1	<b>21 844,4</b>	79%	15%	94%	<b>1 325,6</b>
	<b>Total Costs</b>	<b>444 762,0</b>	<b>284 560,2</b>	<b>114 054,1</b>	<b>398 614,3</b>	<b>64%</b>	<b>26%</b>	<b>90%</b>	<b>46 147,7</b>
<b>TOTAL</b>	<b>Total Person-month</b>	<b>267,8</b>	<b>145,1</b>	<b>167,0</b>	<b>312,1</b>	<b>54%</b>	<b>62%</b>	<b>117%</b>	<b>-44,3</b>
	Personnel costs	<b>1 768 688,0</b>	<b>978 368,0</b>	<b>1 046 746,2</b>	<b>2 025 114,1</b>	<b>55%</b>	<b>59%</b>	<b>114%</b>	<b>-256 426,1</b>
	Equipment	<b>110 000,0</b>	<b>87 586,6</b>	<b>10 877,2</b>	<b>98 463,8</b>	<b>80%</b>	<b>10%</b>	<b>90%</b>	<b>11 536,2</b>
	Travel	<b>125 000,0</b>	<b>31 199,0</b>	<b>65 581,3</b>	<b>96 780,3</b>	<b>25%</b>	<b>52%</b>	<b>77%</b>	<b>28 219,7</b>
	Other costs	<b>84 837,2</b>	<b>45 767,2</b>	<b>34 778,0</b>	<b>80 545,2</b>	<b>54%</b>	<b>41%</b>	<b>95%</b>	<b>4 292,0</b>
	<b>Total Costs</b>	<b>2 088 525,2</b>	<b>1 142 920,7</b>	<b>1 157 982,7</b>	<b>2 300 903,4</b>	<b>55%</b>	<b>55%</b>	<b>110%</b>	<b>-212 378,2</b>

Table 2: Cost-budget Follow-up.



## Section 2 – Summary financial report

Summary Financial Report																
Type of Instrument		STREP	Project Title (or Acronym)		PATRES			Contract N°			43268					
Reporting period number		1 and 2		From (dd/mm/yyyy)		01/02/2007		To (dd/mm/yyyy)		31/01/2010		Page	1/1			
Contractor n°	Organisation Short Name	Cost model used	Eligible costs (in €)	Type of activities						Total eligible costs			Receipts			
				Research and Technological Development / Innovation (A)			Management of the consortium (D)			Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	
Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor							AC Third party(ies)
1	Cemagref	FC	Direct eligible costs	431 407,53			22 068,78			453 476,31	0,00	0,00				
			<i>of which direct eligible costs of subcontracting</i>								0,00	0,00	0,00			
			Indirect eligible costs	247 569,29			12 802,84			260 372,13	0,00	0,00				
			Adjustment on previous period(s)							0,00	0,00	0,00				
Total eligible costs			678 976,82	0,00	0,00	34 871,62	0,00	0,00	713 848,44	0,00	0,00					
2	UniS	AC	Direct eligible costs	182 620,90			3 200,55			185 821,45	0,00	0,00				
			<i>of which direct eligible costs of subcontracting</i>				3 200,55			3 200,55	0,00	0,00				
			Indirect eligible costs	36 524,17						36 524,17	0,00	0,00				
			Adjustment on previous period(s)							0,00	0,00	0,00				
Total eligible costs			219 145,07	0,00	0,00	3 200,55	0,00	0,00	222 345,62	0,00	0,00					
3	UIB	FC	Direct eligible costs	300 331,54			11 231,43			311 562,97	0,00	0,00				
			<i>of which direct eligible costs of subcontracting</i>	0,00			3 800,00			3 800,00	0,00	0,00				
			Indirect eligible costs	183 295,82			5 134,08			188 429,90	0,00	0,00			18 500,00	
			Adjustment on previous period(s)	5 278,96			207,41			5 486,37	0,00	0,00				
Total eligible costs			488 906,32	0,00	0,00	16 572,92	0,00	0,00	505 479,24	0,00	0,00					
4	UFZ	FC	Direct eligible costs	274 092,58			504,21			274 596,79	0,00	0,00				
			<i>of which direct eligible costs of subcontracting</i>	5 005,00						5 005,00	0,00	0,00				
			Indirect eligible costs	189 750,34						189 750,34	0,00	0,00				
			Adjustment on previous period(s)	-3 731,30						-3 731,30	0,00	0,00				
Total eligible costs			460 111,62	0,00	0,00	504,21	0,00	0,00	460 615,83	0,00	0,00					
5	CNRS	FCF	Direct eligible costs	332 178,57						332 178,57	0,00	0,00				
			<i>of which direct eligible costs of subcontracting</i>							0,00	0,00	0,00				
			Indirect eligible costs	66 435,71						66 435,71	0,00	0,00				
			Adjustment on previous period(s)							0,00	0,00	0,00				
Total eligible costs			398 614,28	0,00	0,00	0,00	0,00	0,00	398 614,28	0,00	0,00					
Total eligible costs				2 245 754,11	0,00	0,00	55 149,30	0,00	0,00	2 300 903,41	0,00	0,00	18 500,00	0,00	0,00	
				2 245 754,11		55 149,30		55 149,30		2 300 903,41		18 500,00		18 500,00		
Requested EC contribution for the reporting period (in €) without taking into account receipts				1 232 449,59	0,00	0,00	55 149,30	0,00	0,00	1 287 598,89						
				1 232 449,59		55 149,30		55 149,30		1 287 598,89						
Requested EC contribution for the reporting period (in €) taking into account receipts [=Periodic Invoice]									1 287 598,89							
Amount of the financial interests generated by the prefinancing																

